SECTION 000000
COVER

PEARL RIVER PUBLIC LIBRARY

80 Franklin Avenue
Pearl River, NY 10965

PROJECT MANUAL FOR

PEARL RIVER PUBLIC LIBRARY COMPLETE RENOVATION

ISSUE FOR BID - May 19th, 2025

LUMP SUM MULTIPLE PRIME CONTRACTS

GENERAL CONSTRUCTION CONTRACT (GCC) 001
PLUMBING AND FIRE PROTECTION CONTRACT (P&FC) 002
HEATING VENTILATING AND AIR CONDITIONING CONTRACT (MC) 003
ELECTRICAL CONTRACT (EC) 004

DESIGNERS:
Lothrop Associates Architects D.P.C.
OLA Consulting Engineers
Silman Structural Engineers
LAA Projtect No.: 2578-02

END OF SECTION

SECTION 000100
TABLE OF CONTENTS

a. PROCUREMENT AND CONTRACTING REQUIREMENTS

i. AIA Document A132 - 2019 Standard Form of Agreement Between Owner and Contractor

1. EXHIBIT C – MILESTONE SCHEDULE

2. EXHIBIT E – FORMS OF LIEN WAIVERS

ii. AIA Document A132 - 2019 Exhibit A

007200 - General Conditions

iii. AIA Document A232 - 2019 General Conditions of the Contract for Construction

007300 - Supplementary Conditions

b. SPECIFICATIONS

Division 01 -- General Requirements

011000 - Summary

012500 - Summary of Multiple Prime Contracts

012000 - Price and Payment Procedures

012300 - Alternates

012500 - Substitution Procedures

013000 - Administrative Requirements

014000 - Quality Requirements

015000 - Temporary Facilities and Controls

015713 - Temporary Erosion and Sediment Control

016000 - Product Requirements

017000 - Execution and Closeout Requirements

017419 - Construction Waste Management and Disposal

017800 - Closeout Submittals

017900 - Demonstration and Training

019113 - General Commissioning Requirements

019114 - Commissioning Authority Responsibilities

Appendix 'A' - Prevailing Wage Schedule

Appendix 'B1' - Hazardous Material Survey Report 1 - ECMS

Appendix 'B2' - Hazardous Material Survey Report 2 - ECMS

Appendix 'B3' - Hazardous Material Survey Report 3 - OES

Appendix 'C' - Geotechnical Report

Appendix 'D' - Project Specification for Asbestos Abatement and Drawings

Appendix 'E' - Roof Assembly Letter and Tapered Insulation Layout

Appendix 'F' - Building Permit

END OF SECTION

Pearl River Public Library Bid Document(s) List – May 2025

Item	Description	Pages
0.0 -	2578-02_25_0331 - PRPL MAIN BUILDING BID SET-006 (184p)	184
0.1 -	2578-02_25_0519 - PRPL MAIN BUILDING Project Manual-006	1959
1.1 -	2578-02_22_0601 - PRPL CHILLER BID SET-004	31
1.2 -	2578-00_22_0715 - PRPL CHILLER BID SET SPEC-004	714
2.1 -	2578-01_23_0525 - PRPL RESTROOM BID SET-005	31
2.1 -	2578-01_23_0425 - PRPL RESTROOM BID SET SPEC-005	703
3.1 -	2578-08_24_0514 - PRPL WINDOW BID SET-007	8
3.3 -	2578-08_24_1011 - PRPL WINDOW BID SET SPEC-007	137
4.0 -	2578-02_89_0221 - 1989 AS-BUILT SET (FOR REFERANCE ONLY)	43

PEARL RIVER PUBLIC LIBRARY CROSS-COORDINATION DESCRIPTION

The **PEARL RIVER PUBLIC LIBRARY RENOVATION AND ADDITION** project is a combination of four (4) distinct project sets listed below.

PEARL RIVER PUBLIC LIBRARY
CHILLER REPLACEMENT - SED#50-03-08-03-6-005-004
(also known as the 004 set)

PEARL RIVER PUBLIC LIBRARY
RESTROOM REOVATION - SED#50-03-08-03-6-005-005
(also known as the 005 set)

PEARL RIVER PUBLIC LIBRARY
RENOVATION & ADDITION - SED #50-03-08-6-005-006
(also known as the 006 set)

PEARL RIVER PUBLIC LIBRARY
WINDOW REPLACEMENT - SED#50-03-08-03-6-005-007
(also known as the 007 set)

The individual project sets were produced independently to allow funding of various portions of the work to come from grants. The term "project set" refers to all the documents associated with a given project including, drawings specifications and other documents. The combined project sets represent one collective project using the name of project set 004 "PEARL RIVER PUBLIC LIBRARY RENOVATION & ADDITION".

Contractors shall: (a) coordinate the work among the different sets and notify the architect of any conflicts or discrepancies discovered, (b) address any discrepancies discovered during the coordination drawings process, and (c) submit payment requisitions in a format that is divided among the four projects to allow tracking and approvals from each of the funding sources.

The following information below describes duplicative and known differences between the (006) project set, and the other project sets with directed resolutions.

PEARL RIVER PUBLIC LIBRARY CHILLER REPLACEMENT (004)

SED#50-03-08-03-6-005-004

Architectural Drawings:

A001 – Combine and coordinate the general notes of project set (004) and project set (006).

A091 – Combine and coordinate the selective demolition of project set (004) and project set (006).

A110 – Combine and coordinate the demolition of project set (004) with project set (006) "UPPER ROOF SELECTIVE DEMOLITION PLAN".

Other architectural drawings in project set (004) are applicable and supplement project set (006).

Structural Drawings:

Structural drawings in project set (004) are applicable and supplement project set (006).

Mechanical Drawings:

MP-1.0 – Chiller and supporting equipment demolition in project set (004) shall supplement project set (006). See sheet M-1.4 in project set (006).

MP-2.1 - Chiller and supporting equipment construction notes in project set (004) shall supplement project set (006). See sheet M-2.3 in project set (006). Piping routes shall follow project set (006) construction directive.

M-5.1 – Omit chilled water system schematic and sequence of operation in project set (004). Use project set (006) for system flow schematics and sequence of operations. See project set (006) sheet M5.1 detail one and related information for chilled water system schematic and specification 230993 for the chilled water system sequence of operation.

M-6.0 – Omit project set (004) chilled water pumps. See project set (006) sheet M-6.1 for pumps.

Other project set (004) mechanical drawings are applicable and supplement the project set (006).

Electrical Drawings:

E1.0 – Remove existing electrical panels #1 and #2 (aka 'P2P'), existing air compressor, existing pumps P5, P6, P7, & P8, and the three (3) existing air handling per project set (007) and coordinate with project set (006).

E-2.0 – Omit ceiling plans and follow project set (006) for equipment and lighting layout. See sheet E-2.2, E-3.1, and related documents in project set (006).

E-5.0 – Coordainte removal of electrical panels with project set (006). See E5.0 and related documents in project set (006) for full electrical demolition and construction scope.

Other electrical drawings in project set (004) are applicable and supplement project set (006).

Plumbing Drawings:

Plumbing drawings in project set (004) are applicable and supplement project set (006).

Specifications Documents:

Omit Divisions 0 and 1 from project set (005) project and apply divisions 0 and 1 from project set (006).

Other Documents:

See1989 Photo Books in project set (006).

See1989 Reference Drawings in project set (006).

See Hazardous Material Report in project set (006).

PEARL RIVER PUBLIC LIBRARY RESTROOM RENOVATION (005)

SED#50-03-08-03-6-005-005

Architectural Drawings:

A001 – Omit door and hardware schedules and legends in project set (005) and refer to door and hardware information, project set (006) sheet A003.

A001 – Supplement Legend in project set (005) with legends data in project set (006) for faucet, hand dryers, soap dispenser and other added accessories.

A002 – Omit egress plan in project set (005) and refer to egress plan in project set (005) sheet A052.

A101 – Omit portable restroom locations in project set (005). Contractors shall provide portable restrooms to suit their needs per the Temporary Facilities Requirements in section 015000 of project set (006).

A102 – Omit 7'-6" height soffits at Family Restroom 2A and 2C in project set (005). Coordinate work in this area with project set (006).

A501 – Omit section 1/A501 in project set (005) and follow 10/A631 and related details in project set (006).

A502 – Omit section 1/A502 in project set (005) and follow 10/A631 and related details in project set (006).

A603 – Omit detail 4/A603 in project set (005) and follow sheet A003 and related details in project set (006).

Other architectural drawings in project set (005) are applicable and supplement the project set (006).

Structural Drawings:

There are no structural drawings in project set (005).

Mechanical Drawings:

M-201 – Omit piping in project set (005) passing through soffit framing and follow project set (006) for sheet M-2.4 and related details for new piping.

M-201 – Omit radiant panel and reflected ceiling plans to reflect dropped ceiling and soffit conditions in project set (006).

M-201 - Omit hot water piping connections in project set (005) and coordinate work with project set (006) sheet M-2.1 for hot water piping connections and routing.

M-201 – Omit supply air ductwork project set (005) and reroute supply air ductwork above the restroom lobby ceiling and feed via VAV-3-4 (740 CFM) per project set (006).

M-201 – Replace wall mounted supply registers in project set (005) with ceiling diffusers and see sheet M2.4 in project set (006).

M-201 – Modify the temperature sensor in the restroom lobby to control hot water reheat coil for VAV-3-4 project set (006).

M-201 – Modify ceilings, soffits, and radiant heat panels (RHP) for ceiling and soffit condition per project set (006).

M-401 – Omit detail one restroom ductwork routed through soffit and provide ductwork above the drop ceiling through the Lobby per project set (006). See sheet M-2.4 in project set (006).

Other mechanical drawings in project set (005) are applicable and supplement the project set (006).

Electrical Drawings:

E-101 – Electrical drawing E-101 in project set (005) supplements E1.0 in project set (006).

E-101 – Demolish electrical panels and fire alarm control panel as indicated on project set (005), drawings E-201 and E-301. Drawing E-201 supplements Drawing E3.0 and related electrical and fire-alarm work in project set (006).

E-101 – Provide cord and plug electrical connections for automatic faucets; provide receptacles for each soap dispenser and provide additional dedicated circuits for hand dryers; connect power circuits in project set (005) to panels RP1 through RP3 in project set (006) and coordinate with other work in project set (006).

E-101 – Demolish electrical panels per E-601 on progress set (005) and coordinate with panel schedules on project set (006) drawing E6.0.

Other electrical drawings are applicable and supplement the project set (006).

Plumbing Drawings:

P-201 – Omit heat tracing for hot water piping near the toilet rooms in project set (005). Provide a hot water recirculation pump and piping system project set (006). See sheets P-2.2 in project set (006).

Other plumbing drawings are applicable and supplement the 006 set.

Specifications Documents:

Omit Divisions 0 and 1 from 005 project and apply divisions 0 and 1 from project 006.

Other Documents:

Use 1989 Reference Drawings provided with project set (006).

Use Hazardous Material Report provided with project set (006).

PEARL RIVER PUBLIC LIBRARY RENOVATION & ADDITION (006)

SED #50-03-08-6-005-006

Project set (006) is the prime baseline project, to which the other projects (004, 005 and 007) are compared. The project bid and construction include all four project sets (004), (005), (006) and (007).

All drawings and related documents for project set (006) apply.

PEARL RIVER PUBLIC LIBRARY WINDOW REPLACEMENT (007)

SED#50-03-08-03-6-005-007

Architectural Drawings:

A001 – Omit code analysis in project set (007) and replace with code analysis in project set (006).

Other architectural drawings in project set (007) are applicable and supplement project set (006).

Structural Drawings:

There are no structural drawings in project set (007).

Mechanical Drawings:

There are no mechanical drawings in project set (007).

Electrical Drawings:

There are no electrical drawings in project set (007).

Plumbing Drawings:

There are no plumbing drawings in project set (007).

Specifications Documents:

Omit Divisions 0 and 1 from project set (007) and replace with divisions 0 and 1 from project (006).

Other Documents:

Use Photo Books in project set (006).

Use 1989 Reference Drawings from project (006).

Use Hazardous Material Report from project (006).

SECTION 000103
PROJECT DIRECTORY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Identification of project team members and their contact information.

1.2 OWNER:

A. Name: Pearl River Public Library

B. Primary Contact: All correspondence from the Contractor to the Architect will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
   1. Construction Manager.

1.3 CONSULTANTS:

A. Architect: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
   1. Company Name: Lothrop Associates Architects D.P.C..
      a. 333 Westchester Avenue.
      b. White Plains.
      c. NY.
      d. 10604.
   2. Primary Contact:
      a. Architect.
      b. NameBob Gabalski.
      c. bgabalski@lothropassociates.com.

B. Structural Engineering Consultant:
   1. Silman.
      a. 32 Old Slip.
      b. 10th Floor.
      c. New York.
      d. NY.
      e. 10005.
      f. 212-620-7970.
   2. Primary Contact:
      a. Structural Engineer.
      b. Derek Trelstad.
      c. derek.trelstad@silman.com.

C. Mechanical Engineering Consultant - Plumbing:
   1. OLA Consulting Engineers.

a. 100 Summit Lake Drive.
b. Suite 102.
c. Valhalla.
d. NY.
e. 10595.
f. 914-919-3198.

2. Primary Contact:
a. MEP Engineer.
b. Aidan Cunningham.
c. acunningham@olace.com.

1.4 Construction Manager:

A. Calgi Construction Management.
1. 58 Lafayette Avenue.
2. Suite 350.
3. White Plains.
4. NY.
5. 10603.
6. 914-682-9423 Ext.102.

B. Primary Contact:
1. Construction Manager.
2. David Chen.
3. dchen@calgiconstruction.com.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 000113
NOTICE TO BIDDERS

PUBLIC NOTICE is hereby given that sealed bids will be received by the Pearl River Public Library at the Circulation Desk within the temporary facility located across the street of the the project at 75 East Central Avenue, Pearl River, NY 10965 for the Pearl River Public Library – Complete Renovation Project of 80 Franklin Avenue, Pearl River, NY 10965 for the following: 2578-00_22_0715 - PRPL CHILLER BID SET SPEC

For NYSED Control # 50-03-08-03-6-005-004 – CHILLER REPLACEMENT
For NYSED Control # 50-03-08-03-6-005-005 – RESTROOM RENOVATION
For NYSED Control # 50-03-08-03-6-005-006 – COMPLETE RENOVATION
For NYSED Control # 50-03-08-03-6-005-007 – WINDOW REPLACEMENT

Contract No. 001 – General Construction (GCC) for all above NYSED Control #s
Contract No. 002 – Plumbing and Fire Protection Construction (P&FC) for all above NYSED Control #s
Contract No. 003 – Mechanical (HVAC) Construction (MC) for all above NYSED Control #s
Contract No. 004 – Electrical Construction (EC) for all above NYSED Control #s

The bids shall be in accordance with the Specifications, Drawings and Terms of the proposed Contract. All Proposals shall be enclosed in a sealed envelope bearing the name and address of the Bidder, addressed to **Mrs. Nancy Shah, Library Director,Pearl River Public Library, 80 Franklin Avenue, Pearl River, NY 10965** and endorsed **"Pearl River Public Library – Complete Renovation"** until **12:00 a.m**. prevailing time on **Tuesday, June 17, 2025.** On that same day 1 hour thereafter at **1:00 p.m**., bids will be publicly opened and read aloud in the Pearl River Public Library's Community Room located at 80 Franklin Avenue, Pearl River, NY 10965. No proposals will be accepted after the said time and date.

OBTAINING DOCUMENTS

The Contract Documents, including Drawings and Specifications, may be viewed after **11:00 AM,Monday, May 19, 2025**, A link to the FTP site for free downloading PDF files of the contract documents will be available to bidders upon email request to the Construction Manager, Calgi Construction Company, Inc. Attention: Mr. David Chen Email: dchen@calgiconstruction.com. If you would like to purchase hard copy sets of the plans and/or specifications, please contact the printer for this project. Plans4Less.com Email: plans@plans4less.com Phone: 855-752-6745 Attn. Brian Burke.

BID SUBMISSIONS

Bids shall be made on the Proposal forms furnished with the Specifications and must be accompanied by a Bid Bond acceptable by Pearl River Public Library in the amount of not less than 5% of the total amount of the Bid. Bidders who submit certified checks must accompany them with a Consent of Surety from a recognized Bonding Company. Checks shall be made payable to Pearl River Public Library and are to be held by the library as a guarantee for the proper execution and delivery of the Contract, Certificate of Insurances and Bonds to secure the faithful performance thereof. In default of such execution and delivery of Contract Certificate of Insurances and Bonds, the amount of the deposit represented by the check shall be forfeited and retained by the library as liquidated damages. No Bidder shall withdraw his bid within **sixty days (60)** after the formal opening thereof.
The Owner reserves the right to waive any informality in any proposals, or to reject any or all proposals and to advertise for new proposals. The accepted low bidder(s) will be required to furnish a 100% Performance Bond and a 100% Labor and Material Payment Bond.

Pre-Bid Meeting

The Pre-bid meeting is scheduled for **Wednesday, June 4, 2025**, at the site, 80 Franklin Avenue, Pearl River, NY 10965 at **10:00 a.m. Attendance for this meeting is highly recommended for all bidders.**

Dated: May 19, 2025.

By: Mrs.Nancy Shah
Library Director

END OF SECTION 00 01 13

SECTION 000115 - LIST OF DRAWING SHEETS

DRAWING NUMBER	DESCRIPTION
	ARCHITECTURAL DRAWINGS
A000	COVER SHEET
	CIVIL ENGINEERING DRAWINGS
EX-1	EXISTING CONDITIONS AND REMOVAL PLAN
SP-1	LAYOUT AND LANDSCAPE PLAN
SP-2	GRADING AND UTILITIES PLAN
SP-3	EROSION AND SEDIMENT CONTROL PLAN
D-1	SITE DETAILS
	ASBESTOS ABATEMENT DRAWINGS
00.00	ASBESTOS LOCATION PLAN - COVER PAGE
01.00	ABATEMENT LOCATION PLAN -1ST FLOOR - SCOPE OF WORK
	ARCHITECTURAL DRAWINGS
A001	NOTES AND LEGENDS
A002	NOTES AND LEGENDS
A003	NOTES AND LEGENDS
A020	ARCHITECTURAL SITE PLAN
A021.0	FIRST FLOOR EXISTING PLAN
A021.1	FIRST FLOOR EXISTING REFLECTED CEILING PLAN
A021.2	EXISTING CLERESTORY REFLECTED CEILING PLAN
A022.0	SECOND FLOOR EXISTING PLAN
A022.1	SECOND FLOOR EXISTING REFLECTED CEILING PLAN
A023.0	ROOF EXISTING PLAN
A051	FIRST FLOOR EGRESS PLAN
A052	SECOND FLOOR EGRESS PLAN
A101	FIRST FLOOR DEMOLITION PLAN
A102	SECOND FLOOR DEMOLITION PLAN
A103.1	LOW ROOF DEMOLITION PLAN
A103.2	MID ROOF DEMOLITION PLAN
A103.3	HIGH ROOF DEMOLITION PLAN
A111.1	FIRST FLOOR CONSTRUCTION PLAN
A111.2	FIRST FLOOR DIMENSION PLAN
A113.1	SECOND FLOOR CONSTRUCTION PLAN
A113.2	SECOND FLOOR DIMENSION PLAN
A114.1	LOW ROOF CONSTRUCTION PLAN
A114.2	MID ROOF CONSTRUCTION PLAN

A114.3	HIGH ROOF CONSTRUCTION PLAN
A121	FIRST FLOOR REFLECTED CEILING PLAN
A122	FIRST FLOOR CLERESTORY REFLECTED CEILING PLAN
A123	SECOND FLOOR HIGH REFLECTED CEILING PLAN
A131	FIRST FLOOR FINISH PLAN
A132	SECOND FLOOR FINISH PLAN
A133	FIRST FLOOR FINISH COLOR DIAGRAM
A134	SECOND FLOOR FINISH COLOR DIAGRAM
A135	FINISH PLAN LAYOUT DIMENSIONS
A141	FIRST FLOOR FURNITURE AND EQUIPMENT PLAN
A142	SECOND FLOOR FURNITURE AND EQUIPMENT PLAN
A151	FIRST FLOOR POWER AND TELEPHONE LOCATION PLAN
A152	SECOND FLOOR POWER AND TELEPHONE LOCATION PLAN
A161	ALTERNATE 1
A201	EXTERIOR ELEVATIONS
A202	BUILDING SECTIONS AND DETAILS
A400	VESTIBULE AND LOBBY PLANS AND ELEVATIONS
A403	ELEVATIONS AND DETAILS
A404	ELEVATIONS AND DETAILS
A405	ELEVATIONS AND DETAILS
A406	DETAILS
A410	DUCT ENCLOSURE
A601.0	ELEVATIONS AND DETAILS
A601.1	ELEVATIONS AND DETAILS
A602	ELEVATIONS AND DETAILS
A603	ELEVATIONS AND DETAILS
A605	ELEVATIONS AND DETAILS
A614	INTERIOR ELEVATIONS
A615	INTERIOR ELEVATIONS
A616	INTERIOR ELEVATIONS
A617	INTERIOR ELEVATIONS
A618	INTERIOR ELEVATIONS
A620	ELEVATIONS AND DETAILS
A631	SECTION DETAILS
A632	SECTION DETAILS
A701	CIRCULATION DESK DETAILS
A702	ELEVATIONS AND DETAILS
A703	ELEVATIONS AND DETAILS

	STRUCTURAL DRAWINGS
S001	GENERAL NOTES 1
S101	FOUNDATION/FIRST FLOOR FRAMING PLAN
S102	SECOND FLOOR FRAMING PLAN
S103	MID ROOF FRAMING PLAN
S104	HIGH ROOF FRAMING PLAN
S401	SECTIONS
S501	TYPICAL DETAILS
	MECHANICAL DRAWINGS
M0.1	MECHANICAL SYMBOLS AND ABBREVIATIONS
M1.1	MECHANICAL FIRST FLOOR PIPING DEMOLITION PLAN
M1.2	MECHANICAL SECOND FLOOR PIPING DEMOLITION PLAN
M1.3	MECHANICAL FIRST FLOOR DUCTWORK DEMOLITION PLAN
M1.4	MECHANICAL SECOND FLOOR DUCTWORK DEMOLITION PLAN
M1.5	MECHANICAL ROOF DEMOLITION PLAN
M2.1	MECHANICAL FIRST FLOOR NEW WORK PIPING PARTIAL PLAN
M2.2	MECHANICAL FIRST FLOOR CLERESTORY PIPING NEW W3ORK PARTIAL PLAN
M2.3	MECHANICAL SECOND FLOOR PIPING NEW WORK PARTIAL PLAN
M2.4	MECHANICAL FIRST FLOOR DUCTWORK NEW WORK PARTIAL PLAN
M2.5	MECHANICAL FIRST FLOOR CLERESTORY DUCTWORK NEW WORK PARTIAL PLAN
M2.6	MECHANICAL SECOND FLOOR DUCTWORK NEW WORK PARTIAL PLAN
M2.7	MECHANICAL ROOF NEW WORK PARTIAL PLAN
M4.1	MECHANICAL BOILER ROOM PARTIAL PLAN
M5.1	MECHANICAL CHW AND HW SYSTEM FLOW DIAGRAMS
M5.2	MULTIZONE ROOTOP UNIT W/ERV SYSTEM SCHEMATIC
M5.3	VAV SYSTEM CONTROL DIAGRAMS
M5.4	AIR FLOW RISER DIAGRAM
M6.1	MECHANICAL EQUIPMENT SCHEDULES
M6.2	MECHANICAL EQUIPMENT SCHEDULES
M7.1	MECHANICAL DETAILS
M7.2	MECHANICAL DETAILS
M7.3	MECHANICAL DETAILS
M7.4	MECHANICAL DETAILS
	PLUMBING DRAWINGS
P0.1	PLUMBING SYMBOLS AND ABBREVIATIONS, NOTES, & SCHEDULES
P1.1	PLUMBING FIRST FLOOR DEMOLITION PLAN
P1.2	PLUMBING SECOND FLOOR DEMOLITION PLAN
P1.3	PLUMBING ROOF DEMOLITION PLAN
P2.1	PLUMBING FIRST FLOOR NEW WORK PLAN
P2.2	PLUMBNG SECOND FLOOR NEW WORK PLAN

P2.3	PLUMBING ROOF NEW WORK PLAN
P5.1	PLUMBING RISER DIAGRAM
P7.1	PLUMBING DETAILS
	SPRINKLER DRAWINGS
SP0.1	SPRINKLER SYMBOLS AND ABBREVIATIONS, NOTES
SP2.1	SPRINKLER FIRST FLOOR NEW WORK PLAN
SP2.2	SPRINKLER CLERESTORY NEW WORK PLAN
SP2.3	SPRINKLER SECOND FLOOR NEW WORK PLAN
SP7.1	SPRINKLER DETAILS
	ELECTRICAL DRAWINGS
E0.1	ELECTRICAL SYMBOLS AND ABBREVIATIONS, NOTES, & SCHEDULES
E1.0	ELECTRICAL FIRST FLOOR DEMOLITION PLAN
E1.1	ELECTRICAL SECOND FLOOR DEMOLITION PLAN
E2.0	ELECTRICAL FIRST FLOOR PLAN - LIGHTING
E2.1	ELECTRICAL FIRST FLOOR CLERESTORY PLAN - LIGHTING
E2.2	ELECTRICAL HIGH FIRST FLOOR AND SECOND FLOOR PLAN - LIGHTING
E3.0	ELECTRICAL FIRST FLOOR PLAN - POWER
E3.1	ELECTRICAL SECOND FLOOR PLAN - POWER
E3.2	ELECTRICAL ROOF PLAN - POWER
E4.0	ELECTRICAL FIRST FLOOR PLAN - FIRE ALARM
E4.1	ELECTRICAL SECOND FLOOR PLAN - FIRE ALARM
E5.0	ELECTRICAL ONE-LINE DIAGRAM & PART PLANS
E6.0	ELECTRICAL PANEL SCHEDULES AND LIGHTING FIXTURE SCHEDULE
E7.0	ELECTRICAL DETAILS
E7.1	ELECTRICAL DETAILS AND FIRE ALARM RISER DIAGRAM

END OF SECTION

SECTION 000116
NYSED INFORMATION

PART 1 - GENERAL

1.1 . GENERAL NYSED INFORMATION

A. This project is regulated by the New York Stated Education Department (NYSED)

B. The Project Control No. for this NYSED Project is: **50-03-08-03-6-005-006**

1.2 UNIFORM SAFETY STANDARDS FOR SCHOOL CONSTRUCTION MAINTENANCE PROJECTS

A. General
1. The listing of the Uniform safety standards for school construction maintenance projects is required by the NYSED.

B. Statements:
1. Statement 1
a. "The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy."
2. Statement 2
a. Indication that all school areas to be disturbed during renovation or demolition have been or will be tested for lead and asbestos. Note, the project folder should contain a letter regarding the presence of asbestos.
3. Statement 3
a. "General safety and security standards for construction projects.
1) All construction materials shall be stored in a safe and secure manner.
2) Fences around construction supplies or debris shall be maintained.
3) Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.
4) During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.
5) Workers shall be required to wear photo-identification badges at all times for identification and security purposes while working at occupied sites."
4. Statement 4
a. "Separation of construction areas from occupied spaces. Construction areas which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used to exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas.

1) A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs or elevators designated for students or school staff.
2) Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.
3) All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session."

5. Statement 5
   a. A plan detailing how exiting required by the applicable building code will be maintained.
6. Statement 6
   a. A plan detailing how adequate ventilation will be maintained during construction.
7. Statement 7
   a. "Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken."
8. Statement 8
   a. "The contractor shall be responsible for the control of chemical fumes, gases, and other contaminates produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure they do not enter occupied portions of the building or air intakes."
9. Statement 9
   a. "The contractor shall be responsible to ensure that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured or ventilated in accordance with manufacturers recommendations before a space can be occupied."
10. Statement 10
    a. "Large and small asbestos abatement projects as defined by 12NYCRR56 shall not be performed while the building is occupied." Note, It is our interpretation that the term "building", as referenced in this section, means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non combustible construction. The isolated portion of the building must contain exists that do not pass through the occupied portion and ventilation systems must be physically separated and sealed at the isolation barrier.
    b. Exterior work such as roofing, flashing, siding, or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and at windows is provided. Care must be taken to schedule work so that classes are not disrupted by noise or visual distraction.
11. Statement 11
    a. Must have a determination made as to the presence of lead. Projects which disturb surfaces that contain lead shall have in the specifications a plan prepared by a certified Lead Risk Assessor of Supervisor which details provisions for occupant

protection, worksite preparation, work methods, cleaning and clearance testing which are in general accordance with the HUD Guidelines.

PART 2 - PRODUCTS

2.1 Not Used

PART 3 - EXECUTION

3.1 Not Used

END OF SECTION

SECTION 000900
CONSTRUCTION MILESTONE SCHEDULE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Divisions 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Milestone dates to be met and indicated in the Contractor's Construction Schedule.

B. Related Sections include the following:
   1. Division 1 Section "Summary of Multiple of Primes" for preparing combined Contractor's combined Construction Schedule.
   2. Division 1 Section "Submittal Procedures" for submitting schedules and reports and for submittal schedule.
   3. Division 1 Section "Progress Schedule" for preparing and submitting Contractor's Construction Schedule

1.3 MILESTONE

A. The following preliminary construction schedule indicates milestones that are critical points in time, which must be incorporated in the Contractor's Construction Schedule.
   1. **Monday, May 19, 2025** - Release of Specifications and Drawings
   2. **Wednesday, June 4, 2025** - Pre-Bid Meeting
   3. **Tuesday, June 17, 2025** - Bid Due Date
   4. **Tuesday, June 17, 2025** - Bid Opening

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTIONS (NOT USED)

END OF SECTION 00 09 00

SECTION 002113
INSTRUCTIONS TO BIDDERS

1. DOCUMENTS: Complete sets of Bidding Documents will be issued for bidding purposes as stated in the "Notice to Bidders". A complete set of Bidding Documents consists of the following:

a. Project Manual/Specifications.
b. Addenda (if any).
c. Contract Drawings.

2. BID PROPOSALS: To be considered, bids must be in accordance with these Instructions to Bidders. All bids must be submitted on the prescribed forms as included herein and as bound in the Specifications titled as: Bid Proposal. All blank spaces for bid prices must be filled in, in both words and figures, either typed or in ink. Bid Proposals that contain any omissions, erasures, alterations, additions, or items not called for in the itemized Bid Proposal, or that contain irregularities of any kind, may constitute sufficient cause for rejection of the bid. In case of any discrepancy between words and figures in the price bid, the price as expressed in words shall govern. All bids must be submitted in sealed envelopes addressed to: The bids shall be in accordance with the Specifications, Drawings and Terms of the proposed Contract. All Proposals shall be enclosed in a sealed envelope bearing the name and address of the Bidder, addressed to **Mrs. Nancy Shah, Library Director, Pearl River Public Library, 80 Franklin Avenue, Pearl River, NY 10965** and endorsed **"Pearl River Public Library – Complete Renovation"** until **12:00 a.m.** prevailing time on **Tuesday, June 17, 2025**. On that same day 1 hour thereafter at **1:00 p.m.**, bids will be publicly opened and read aloud in the **Pearl River Public Library's Community Room** located at **80 Franklin Avenue, Pearl River, NY 10965**. **Any bids received after that time will not be accepted.** Bid Proposals shall be signed with the name typed or printed legibly below the signature. The Bidder's seal, if a corporation, shall be affixed under the Bidder's signature. Email, Telephone or telegraphic bids will not be accepted.

If separate sets of Bid Proposal sheets are issued, they may be used with the understanding that all instructions and conditions of the Contract Documents are the same as if these pages were bound therein.

PREPARATION OF BID PROPOSAL

A. Bid Proposals must be submitted upon the prescribed form, one copy of which is attached hereto. All blank spaces for bid prices must be filled in, in ink, in both words and figures. The Bidder shall submit as their bid one copy of the Bid Proposal Form, and keep a copy for their records. Bid Proposals shall consist of the following, filled-in and executed:
   1. Bid Security
   2. Bid Proposal Form
   3. References
   4. Bid Proposal Certifications (Non-Collusive Form and General Municipal Law §103-g(4) Form)
   5. Statement of Bidder's Qualifications
   6. Letter from Insurance Carrier verifying that Contractor meets Insurance Requirements as per bid specifications- **Contractor Insurance requirements are as noted in General Conditions, Article 11 – Insurance & Bonds and Supplementary General Conditions, Section 00 07 20.**
   7. Certified letter from Bonding Company, indicating that they meet the minimum requirement required by the contract to be awarded and stating that it will provide the necessary 100% Performance Bond and 100% Labor and Material Payment Bond for the project being bid.

All bids must be submitted in sealed envelopes, bearing on the outside, the name of the Bidder, their address, the name of the project and Contract Number bid upon. Bid Proposals enclosed shall be delivered on or before the date, time and at location stipulated above.

3. QUALIFICATIONS OF BIDDERS: The **Pearl River Public Library, hereinafter referred to as the "Library"** may make such investigations as it deems necessary to determine the qualifications of the Bidder to perform the work, and the Bidder shall furnish information and data for this purpose as is required (see Statement of Bidders Qualifications). The **Library** reserves the right to reject any bid if the evidence submitted by a Bidder, or the investigation of such Bidder, fails to satisfy the Library that such Bidder is properly qualified to carry out the obligations of the contract to be awarded and to complete the work contemplated therein within the time designated. Fraudulent statements shall cause rejection of the subject bid and forfeiture of the related bid security.

To be considered qualified, a Bidder must demonstrate to the **Library's** satisfaction:
(a) The Corporation, partnership, sole proprietorship or other business entity in whose name bid is submitted has been in business, continuously, for no less than the previous five (5) years performing or coordinating the Work which they are bidding on.
(b) The Bidder has satisfactorily completed no less than five (5) projects of comparable size and complexity to this project working in occupied recreational spaces as a Prime Contractor to a Project Owner.
(c) The Bidder is not currently involved in bankruptcy proceedings.
(d) The Bidder is licensed to perform the Work they are bidding on in the jurisdiction in which the Work will take place.
(e) The Bidder is capable of and intends to perform at least 25% of the Work with their own forces.
(f) The Bidder is able to perform the Work with the manpower available to them.
(g) The Bidder and each of its sub-contractors must have five (5) years' experience in the Work and/or applicable trade.
(h) The successful Bidder's Field Superintendent must have at least five (5) years as a working field superintendent. The Field Superintendent shall speak fluent English or the successful Bidder shall supply an interpreter to be at the project site whenever the Field Superintendent is there at no additional cost to the Village.

4. CONDITIONS OF WORK: Each Bidder must inform themselves fully of all conditions under which the work will be performed. Failure to do so will not relieve a successful Bidder of its obligation to furnish all material and labor necessary to carry out the provisions of the contract to be awarded and to complete the work for the consideration set forth in its bid. Each Bidder's attention is directed to Paragraph 1 of the Bid Proposal, in which the Bidder certifies that they have examined the site. The Bid Proposal shall include the complete costs of furnishing all materials, labor and equipment necessary to complete the work in accordance with the Contract Plans and Specifications and all other expenses incidental thereto. Local and State sales taxes shall not be included in the bid. Insofar as possible, the successful Bidder, in carrying out the work, must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor, or of the proper functioning of the existing facilities of adjacent or contiguous properties, and shall be maintained insofar as possible.

5. ADDENDA AND INTERPRETATION:

a. **ADDENDA**: Additions or deletions to the scope of work and supplemental Instructions to Bidders may be issued by the Library in the form of an ADDENDUM.
b. **REQUESTS FOR INFORMATION AND INTERPRETATIONS**: Every request for information or interpretation of Specifications, Addenda, or Contract Drawings must be addressed in writing using the enclosed form in the Specifications (Section 00 02 15) and emailed to the **Construction Manager, Calgi Construction Company, Inc. Email -**

dchen@calgiconstruction.com Attention: Mr. David Chen and CC the Architect, Lothrop Associates Architects D.P.C., Email: desealy@lothropassociates.com **Attention: Mr. Darius Sealy.**
To be given any consideration, all requests for information or interpretation must be received at least **seven (7) business days** prior to the date fixed for the opening of bids. Any and all such interpretations, and any supplemental instructions, will be issued in the form of a written Addenda and will be Emailed to all prospective Bidders. The failure of any Bidder to receive any such Addenda will not relieve the Bidder of any obligation under his Bid as submitted. Any Addenda so issued shall become part of the Bidding Documents. Receipt of Addenda shall be noted on the "Bid Proposal Form."

6. BID SECURITY: Each Bidder is required to deposit, at the time of submission of their bid, a Bid Bond or certified check in an amount representing five (5%) percent of their bid, payable to **Pearl River Public Library,** which amount the Bidder agrees is to be forfeited as liquidated damages and not as a penalty if the Bidder is awarded the contract and thereafter fails to execute a contract with the **Pearl River Public Library** under the conditions of the Bidding Documents or to furnish the bonds required for the faithful performance of the awarded contract. Bidders who submit certified checks must accompany them with a Consent of Surety from a recognized bonding company agreeing to supply a 100% Performance Bond and 100% Labor and Materials Bond if the contract is awarded to the Bidder.

Such bid security will be returned to all except the three lowest formal Bidders within three days after the formal opening of bids, and the remaining bid security will be returned to the other Bidders after the **Library** and the accepted Bidder have executed a contract. In the event no contract has been so executed within SIXTY (60) calendar days after the date of the opening of bids, upon the demand of the Bidder, so long as Bidder has not been notified of the acceptance of the bid, Bidder's security will be returned. The Bid Security of the successful Bidder will be retained until the signing of the awarded contract and the filing and approval of the bonds and insurance certificates.

7. INSURANCE REQUIRED: The successful Bidder will be required to procure and pay for the following types of insurance. **Contractor Insurance requirements are as noted in General Conditions, Article 11 – Insurance & Bonds and Supplementary General Conditions, Section 00 07 10.**

a. Commercial General Liability
b. Statutory Workers Compensation
c. Commercial Automobile Liability
d. Umbrella Liability/Excess Liability
e. Contractors Pollution Liability

8. SECURITY FOR FAITHFUL PERFORMANCE: **The successful Bidder shall, prior to execution of the awarded contract, submit executed bonds: (1) a Performance Bond in amount equal to one hundred percent (100%) of the accepted bid as security for the faithful performance of the terms, covenants and conditions of the awarded contract; and (2) a Labor and Materials Payment Bond for the full amount of the awarded contract price guaranteeing the full payment of all persons performing labor or furnishing materials or rentals under the awarded contract.**

In addition, at the time of final payment, a two year (2) Maintenance Bond guaranteeing against defective materials and workmanship will be required in an amount equal to one hundred percent (100%) of the adjusted contract amount.*This Bond in no way removes the obligation of the successful Bidder to comply with the standard one (1) year guarantee / warranty as specified elsewhere in the Specifications. (Standard One year guarantee and warranty, plus Additional Two Years Maintenance Bond)*

The Bonds shall be prepared on standard AIA forms as follows: Performance Bond and Payment Bond shall be in accordance with the latest A.I.A. Document A-312. Bonds shall have as Surety thereon such Surety Company or companies as are acceptable to the **Library** and are authorized to transact business in the State of New York.

All Bonding companies supplying bid, performance, payment and maintenance bonds are required to provide, with the bid package, the following required information. Bidders failing to provide this information will not be considered. Provide a certified statement that the bonding company meets or exceeds the following:

1. ***A.M. Best Company (Old Wick, New Jersey) Rating of A or better.***
2. ***(FPR) Financial Performance Rating from A.M. Best of not less than VI.***
3. ***Bonding Company must be registered to do business in New York State.***
4. ***Listed in the U.S. Treasury Circular 570 (1994 or current version).***
5. ***If underwriting limitation is less than the required performance bond amount, then the excess amount must be protected by co-insurance with a company meeting the same standards as above.***

9. FORM OF AGREEMENT: The form of agreement shall be the **Standard Form of Agreement Between Owner and Contractor,** Construction Manager as Advisor Edition, AIA Document A132-2009, modified to conform to the Bidding Documents.

10. AWARD:

a. Contract award will be made to the lowest responsible Bidder to be determined at the **Library's** discretion as follows:
    1. If the award is to be made on the basis of Base Bid only, it may be made to that responsible Bidder whose Base Bid therefore is the lowest.
    2. If the award is to be made on the basis of a combination of Base Bids with Alternates, it may be made to that responsible Bidder, whose net bid on such combination is the lowest, using such Alternates as selected by the Owner.

b. The **Library** reserves the discretionary right to waive what it deems to be informalities relating to a specific bid, to waive what it deems to be technical defects, irregularities and omissions relating to a specific bid, and to request additional information from any Bidder.

c. The **Library** reserves the discretionary right to reject any or all bids within sixty (60) days of bid opening, if in its opinion the best interest of the District will thereby be promoted, and to advertise for new bids.

11. OWNER: **Pearl River Public Library at 80 Franklin Avenue, Pearl River, NY 10965. County of Rockland in the State of New York.**

12. SALES TAX EXEMPTION: Under Chapter 513 of the Laws of New York 1974, all materials and supplies sold to a contractor, and which are to become an integral, component part of a structure, building or real property owned by an exempt organization such as the Pearl River Public Library are exempt from the payment of New York State Sales and Compensatory Use taxes. Therefore, Bidders should not include any amount in their bid price to cover sales taxes for the above items.

13. REQUIRED SUBMISSIONS: Prior to award, the successful Bidder will be required to meet the following requirements:

a. The successful Bidder, if their business is not registered in New York State, must provide the **Library** with a certificate issued by the Secretary of State of New York stating that the Corporation is authorized to do business within the State and is presently in good standing. If the entity to whom the bid is awarded is not a corporation, it would be required that the entity's certificate of doing business, which should be on file in the County Clerk's Office, Rockland County, be provided. (This would also hold true in the case of joint ventures which would be required to disclose the underlying entities which make up the joint venture and the supplying of the requisite certificate of doing business of each such entity.)

b. A statement by the successful Bidder that no officer, director or stockholder of the successful Bidder is an officer or employee of the **Library** or is a relative of any such **Library** officer or employee. If such officer, director or stockholder does exist, their names and relationship shall be disclosed to the **Library.**

c. The successful Bidder shall submit the following, in a form acceptable to the Library, for approval before being permitted to start work:

i. Signed Contract
ii. Certificates of Insurance
iii. Labor and Material Payment Bond
iv. Performance Bond
v. *Schedule of Values**
vi. Construction Schedule
vii. Submittal Schedule

**The Schedule of Values included as part of the Bid Proposal is for the purpose of bid evaluation only. The Schedule of Values referenced here as item v. is the one that will accompany the Contractor's Payment Requisition form and must be reviewed and approved by the Architect and Construction Manager before the first payment requisition is submitted.*

14. AFFIRMATIVE ACTION REQUIREMENTS: The Bidder agrees and warrants that in the performance of the contract to be awarded, the Bidder will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, disability, age, sex, religion or national origin in any manner prohibited by the laws of the United States, New York State, County of Westchester and further agrees to provide any information that may be requested by the **Library** or it's Consultants or any Governmental Agency concerning practices and procedures of the Bidder as related to the provisions of this section.

15. CERTIFIED PAYROLL: The successful Bidder will be required to submit a certified payroll certificate with each monthly payment requisition.

16. SITE SUPERVISION: THE SUCCESSFUL BIDDER IS TO PROVIDE FULL TIME SITE SUPERVISION FOR HIS OR HER STAFF, SUBCONTRACTORS AND SUPPLIERS FOR THE DURATION OF THIS PROJECT. A competent superintendent shall be in attendance at the job site at all times when work is being performed under the contract to be awarded. A qualified site superintendent must have the authority to represent and make decisions for his or her company with regards to the subject job, must be able to give guidance and direction to employees, subcontractors and suppliers, and must be knowledgeable about the work to be provided. FAILURE TO PROVIDE A QUALIFIED SITE SUPERINTENDENT AT THE JOB SITE SHALL SUBJECT THE SUCCESSFUL BIDDER TO A PENALTY OF **$500 PER DAY FOR EVERY OCCURRENCE.**

17. LIQUIDATED DAMAGES FOR FAILURE TO COMPLETE THE PROJECT ON TIME:By submitting a Bid Proposal, Bidders recognize and agree that time is of the essence on the contract to be awarded and the date of Substantial Completion shall be no later than the date indicated in the Contract Documents. In the event the successful Bidder fails to substantially complete the work under the awarded contract by said scheduled date, each Bidder agrees liquidated damages of $1,000.00 per calendar day will be subtracted from the payment due the successful Bidder as follows:

Liquidated damages of $1,000.00 per day beginning on the fifth calendar day after the substantial completion dates listed, except in cases where a delay is due to unforeseeable causes beyond the control and without the fault or negligence of the successful Bidder including, acts of God, or of a public enemy, acts of the Government, in either its sovereign or contractual capacity, fire, floods, epidemics, quarantine restrictions, strikes, freight embargoes, or delays of Subcontractors or Suppliers due to such causes. Delay in acquisition of materials other than by reason of strike or freight embargoes will not constitute a delay excusable under this provision unless approved by the **Library** in writing.

Within five calendar days from the occurrence of any such delay, the successful Bidder shall notify the **Library** in writing of the cause of delay. The **Library** will ascertain the facts and extent of the delay, and extend the time for completing the Work when in the judgment of the **Library's** Architect and Construction Manager that the findings of fact justify such an extension. The **Library's** findings of fact will be final and binding.
The said sum of $1,000.00 per calendar day shall constitute the Liquidated Damages incurred by the **Library** for each day of delay beyond the agreed upon dates of substantial completion. Such Liquidated Damages shall be in addition to any other damages, other than by reason of delay, which the **Library** may incur as a result of the successful Bidder's breach of contract.

In the event the successful Bidder fails to complete all work under the awarded contract by said scheduled dates and the **Library** has taken occupancy, the successful Bidder will not be permitted to perform any work during normal business hours. Such work shall only be performed after the **Library's** business hours, Saturdays, Sundays, holidays or periods when the facility is unoccupied, and at no additional cost to the Owner.

In addition to Liquidated Damages, the successful Bidder shall be liable for all additional costs incurred by the **Library** to provide staff required to make the facility accessible to the successful Bidder, the Architect, their Consultants and the Construction Manager as required to perform inspections after the completion date of the awarded contract. (Inspections will be performed on a regular basis, during construction, by the Architect, their Consultants and Construction Manager. The same schedule will be followed in the event that the completion date of the awarded contract is not met, unless the Library, their Architect and Construction Manager determine, at their sole discretion, that additional inspections are needed.)

All costs incurred by the **Library**, and the cost of additional Architectural and Construction Manager inspections, will be subtracted from payment due the successful Bidder (or, if the amount due the successful Bidder for payment is insufficient, any deficiency shall be paid by the successful Bidder to the **Library**).

18. OBLIGATION OF BIDDERS:

A. At the time of the opening of bids, each Bidder will be presumed to have inspected the site and to have examined and to be thoroughly familiar with the Contract Drawings, General Conditions, General Requirements of the contract to be awarded, and Specifications (including all Addenda thereto). Each Bidder will also be presumed to be familiar with the scope and schedule of other projects that maybe concurrently scheduled at the project site. The failure of or omission of any Bidder to receive or examine any Contract Drawings, form, instruction or document shall in no way relieve any Bidder from any obligation in respect to its bid.

B. Each Bidder shall, by careful examination of the site, satisfy themselves as to the location of the work, the character, the quality and quantity of the work to be performed and materials to be furnished, the character of equipment and facilities needed preliminary to and during prosecution of the work, the general and local conditions and all other matters which in any way affect the work specified in the Contract Documents.

C. After the contract has been awarded, no consideration will be given for any misunderstanding as to the work and materials set forth in the Contract Documents and shown on any of the accompanying Contract Drawings, details or schedules, it being mutually understood that the tender of a bid carries with it an agreement to this and other obligations set forth in the Contract Documents, including but not limited to Specifications, Contract Drawings and details, noted indications and requirements.

D. Each Bidder should review the State of New York Department of Labor Schedules of the prevailing hourly wage rates, the prevailing hourly supplements, and the requirements for all Contractors and Subcontractors engaged on public work projects in New York State.

E. It is the intention of the Contract Documents, including but not limited to Specifications and Contract Drawings, to provide for a complete, key-in- lock job under each particular prime contract. The bid should therefore include all items of labor and materials, including all patching and repair work necessary even though such items may not be specifically noted to complete finished job.

F. During the bidding and construction process, each Bidder is responsible for reading all Contract Drawings and all Specification sections and performing any work which falls under the Bidder's trade. Each Bidder is also responsible to be familiar with the Contract Drawings and Specifications of the work of the other contractors at work on this project.

19. RETAINAGE: The successful Bidder's application for payment will be based on a 5% (five percent) retainage. The 5% retainage shall be retained until final acceptance of the project, at which time the retainage shall be released upon submission of required close-out documents.

20. SITE INSPECTION: See Notice to Bidders for scheduled pre-bid meeting.

21. SUBMITTALS: All long lead items shall be submitted within ten (10) working days of the start of work. Refer to Specifications for additional requirements.

22. LIBRARY'S TIME AND DAMAGE CLAIMS:

A. Any time or expenses incurred by the **Library's** Architect, the Architect's Consultants and Construction Manager as a result of the successful Bidder's activities, unless otherwise specifically agreed to in writing by the **Library,** will be back-charged to the successful Bidder.

B. Overtime rates as follows:

Discipline	Weekdays: 6:00 pm to 6:00 am All day Saturday	Sundays, Holidays All day
Architect	$250.00/hour	$300.00/hour
Civil Engineer	$225.00/hour	$275.00/hour
Structural Engineer	$165.00/hour	$205.00/hour
MEP Engineer	$205.00/hour	$230.00/hour
Construction Manager	$205.00/hour	$230.00/hour

C. Except when deemed an emergency or specialty service (i.e.: fire or security alarm) by the **Library**, the successful Bidder will be given written notice concerning required repairs to damages caused by the successful Bidder's activities. If the damages are not corrected to the **Library's** satisfaction and per the Library's time frame, the **Library** will make the corrections and back-charge the successful Bidder accordingly via a reduction in the amount of the awarded contract.

23. PROJECT CLOSE-OUT INSPECTION PROCEDURES: Upon receipt of a request for an inspection or on the date scheduled for substantial completion, whichever comes first, the Architect and Construction Manager will conduct an inspection and issue a list of all incomplete and/or defective work that must be completed or corrected before a Certificate of Substantial Completion will be issued.

The successful Bidder shall complete all remaining work and punch list items within twenty-one (21) calendar days of receipt of the Punch List. Should the successful Bidder fail to complete the work as described herein, the **Library** may without further delay, terminate the awarded contract, withhold all further payments, and complete the work to the **Library's** convenience deducting all costs to administer, perform and inspect the completion of the work from the balance due upon the awarded contract.

The Architect and Construction Manager will conduct one re-inspection at the completion of all punch list items, when requested and assured that the Work has been completed by the successful Bidder. If the work has not been completed by the successful Bidder, the cost to perform subsequent inspections by the Architect and Construction Manager will be subtracted from payment due the successful Bidder (or, if the amount due the successful Bidder is insufficient, any deficiency shall be paid by the successful Bidder to the **Library**).

Final acceptance of the work and approval of final payment will occur only after the Architect has conducted an inspection/re-inspection to verify the work is complete and adequate.

END OF SECTION 00 02 12

SECTION 003100
AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.1 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:

B. Hazardous Material Survey Report 1: Entitled Amended Limited Asbestos Inspection, Ceiling & Roofing Materials Services @ Pearl River Library, dated April 15, 2022, prepared by Environmental Consulting and Management Services.
   1. See Appendix 'B1' material.

C. Hazardous Material Survey Report 2: Entitled Limited Asbestos & Lead Based Paint Inspection, Bathroom & Sitting Room @ Pearl River Library, dated April 20, 2023, prepared by Environmental Consulting and Management Services.
   1. See Appendix 'B2' material.

D. Hazardous Material Survey Report 3: Entitled Pre-Renovation Asbestos, XRF Lead Paint, and PCB Screen Report, dated June 10, 2020, prepared by Omega Environmental Services, Inc..
   1. See Appendix 'B3' material.

E. Geotechnical Report: Entitled Subsurface Soil and Foundation Investigation for 80 Franklin Avenue, Pearl River, NY, dated April 18, 2024.
   1. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.
   2. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.
   3. Refer to Appendix 'C' material.

F. Project Specifications for Asbestos Abatement and Drawings, dated May 23, 2024.
   1. These specifications and drawngs identify locations where known asbestos containing materials exist and specify required abatement procedures.
   2. Refer to Appendix 'D' material.

G. Existing Conditions Survey:
   1. This survey identifies conditions of existing construction prepared primarily for the use of Architect in establishing the extent of the new versus existing work.
   2. This survey includes a photographic record of existing conditions visible.

1.2 ORIGINAL DESIGN AND AS-BUILT DRAWINGS

A. Design drawings entitled "Addition & Alteration to the Pearl River Public Library" prepared by Michael Esmay Architecture, Planning, and Interior Design, dated February 2, 1989.

B. As-Built drawings entitled "Addition & Alteration to the Pearl River Public Library" prepared by Michael Esmay Architecture, Planning, and I ,nterior Design, dated April 27, 1990.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 OBTAINMENT OF PERMITS

A. Contractor to obtain the following required permits, at no cost to Owner:
   1. Building Permit for all trades.

B. Building Permit Procedures: When required to obtain this permit:
   1. Complete and file permit application(s) with appropriate agency.
   2. Pay required fees.
   3. Advise Architect if submission of modified documents is necessary to have the authorities having jurisdiction complete the plan review and approval process. Submit modified documents expeditiously.
   4. Do not commence execution of any item of work for which a permit has not been obtained.

END OF SECTION

SECTION 003143
PERMITS

PART 1 – GENERAL

1.1 DESCRIPTION:

A. This Section provides specific information and defines specific requirements of the Contractor regarding the preparation and acquisition of permits required to perform the work of this project.

1.2 RELATED WORK:

A. Section 01 10 00, SUMMARY

B. Section 01 14 19.16, DUST CONTROL

C. Section 02 41 22, UTILITY ABANDONMENT

D. Section 31 23 00, EARTHWORK

E. Section 31 23 19, DEWATERING

1.3 GENERAL REQUIREMENTS:

A. The Owner has obtained or will obtain and pay for the permits listed below, which are required for this project. The Contractor shall assist in obtaining certain permits, as indicated. The Contractor shall obtain and pay for all other permits required, as defined under the Permits subsection of Section 00 07 10, GENERAL CONDITIONS.

Permits by Owner	Status
NYSED Building Permit	Done
Backflow Preventers	*
State Pollution Discharge Elimination System (SPDES) General Permit	*
*Contractor shall prepare permit application and obtain the permit after contract is awarded, bearing all expenses. Owner will pay for and/or waive the permit application fee, if applicable.	

PART 2 - PRODUCTS (NOT USED

PART 3 – EXECUTION

3.1 PERFORM WORK IN ACCORDANCE WITH REQUIREMENTS:

A. The Contractor shall perform the work in accordance with the Contract Documents, including the attached permits/order of conditions, and any applicable municipal requirements.

B. Prior to commencing any construction activities, the Contractor shall demonstrate to the Owner and the Engineer, through on-site inspection and submitting copies of permits or approvals, that it is in full compliance with the terms and conditions of all permits specified herein. The Contractor shall maintain full compliance with all permits throughout the performance of the work, and upon request, grant access to permitting authorities to inspect the site for the purpose of verifying such compliance.

END OF SECTION 00 31 43

SECTION 00 41 00.01
FORM OF PROPOSAL

1.1 INFORMATION

A. Bid presented to: Mr. Edward Falcone, Interim Library Director, Pearl River Public Library, 80 Franklin Avenue, Pearl River, NY 10965 and endorsed "Pearl River Public Library – Complete Renovation".

B. Bid presented by:

a. **Legal name, address, Phone # and Email of Bidder:**

_____

_____

_____

C. Bid presented for: "Pearl River Public Library – Complete Renovation" 80 Franklin Avenue, Pearl River, NY 10965

TRADE: General Construction (GCC) CONTRACT NO. 001

D. The bidder by making a bid represents that:

a. The Bidder has read and understands the Bidding Documents titled "Pearl River Public Library – Complete Renovation", Pearl River Public Library and the Bid is made in accordance therewith.

b. The Bidder has read and understands the Bidding Documents and Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

c. The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidders personal observations with the requirements of the proposed Contract Documents.

d. The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.

E. Addenda:

a. The Bidder acknowledges receiving all Addenda and including their provisions in the Bid.

b. Indicate the Addenda numbers received: **Addendum Numbers and Dates Received**

F. Bid:

a. The Bidder proposes to perform the Work for the following lump sum amount:

For NYSED Control # 50-03-08-03-6-005-004 – CHILLER REPLACEMENT
For NYSED Control # 50-03-08-03-6-005-005 – RESTROOM RENOVATION
For NYSED Control # 50-03-08-03-6-005-006 – COMPLETE RENOVATION
For NYSED Control # 50-03-08-03-6-005-007 – WINDOW REPLACEMENT

BASE BID Lump Sum Amount to include **ALLOWANCE of ($350,000.00):**

$_____(Numerical amount)

_____Dollars(Written amount)

b. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-004 – CHILLER REPLACEMENT

$_____(Numerical amount)

_____Dollars(Written amount)

c. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-005 – RESTROOM RENOVATION

$_____(Numerical amount)

_____Dollars(Written amount)

d. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-006 – COMPLETE RENOVATION

$_____(Numerical amount)

_____Dollars(Written amount)

e. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-007 – WINDOW REPLACEMENT

$_____(Numerical amount)

_____Dollars(Written amount)

G. Complete the following applicable page(s) and the final page "Execution" paragraph:

H. Alternates:

1. Add: Conference Rooms Shown on Sheet A 161

NARRATIVE
Addition of five (5) small Conference Rooms.

General Construction (GCC) Contract No. 001
Reference A161 and all related drawings and specifications. Construct conference rooms as depicted. Stud partitions between rooms, outer partition(s) and doors to be Aluminum framed glass.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003
Reference M2.2 and all related drawings and specifications for detailed information on the required HVAC and other mechanical components required for this Alternate.

Electrical Construction (EC) Contract No. 004
Reference E2.0, E3.0, E4.0, and all related drawings and specifications for detailed information on the required electrical outlets, lighting fixtures and other wiring/cable required for this Alternate.

ADD: $_____

2 a. Add: Electric Service Conduit and Wiring

NARRATIVE
New, below grade/embedded conduit and new electrical service wiring.

General Construction (GCC) Contract No. 001
Reference A020, E7.0, S-501.00 and all related drawings and specifications.
Excavate trenches at existing interior concrete slab for installation of new conduit and wiring.
Excavate exterior concrete slab and asphalt at the parking lot with trench for installation of new conduit and wiring. Coordinate with EC installation for backfill, compact and cover/patch trenched areas with new level concrete slab, per details provided – prior to backfill, allow PE to inspect.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003 – NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
Reference A020, E7.0, S-501.00 and all related drawings and specifications.
Refer to the electrical drawings and specifications for detailed information on conduit and wiring replacement.
Install new conduit and new wiring from transformer to service panels at the Mechanical Room.

ADD: $_____

2 b. Add: Electric Service Wiring

NARRATIVE
New electrical service wiring within existing below grade/embedded conduit.

General Construction (GCC) Contract No. 001 - NO ADDITIONAL WORK

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003 – NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
Refer to the electrical scope and all related drawings and specifications for the detailed information on wiring replacement required for this Alternate.

ADD: $_____

3. Deduct: Unfinished Second Floor with Equipment Room, Closet, and Secure Storage Room

NARRATIVE
Open stair, landings, Elevator, Plumbing, Walls and Doors of expanded Second Floor Area omitted.

General Construction (GCC) Contract No. 001
Expanded Second Floor to be partially unfinished. Equipment Room including Secure Storage Room partitions, openings, and equipment required therein will be completed as per the original plans. Other rooms and restrooms will not be built at the expanded Second Floor. At perimeter of expanded Second Floor area, install a full height wall as shown on base plans, finished with painted gypsum on either side.

NOTE: Guard rails at the expanded Second Floor are omitted with this Alternate.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002
Reference P-0.1, P-2.1, P-2.2, P-5.1, SP-2.1, SP-2 and all related drawings and specifications.
All plumbing work within Toilet Rooms 204 and 205 shall be excluded from the scope. This includes the routing of domestic cold and hot water, sanitary, and vent pipes to the toilets, lavatories, and floor drains. Additionally, elevator sump pump ESP-1 and associate pump discharge piping shall be excluded from the scope.

The sprinklers of the unfinished Second Floor shall be exposed upright types instead of concealed pendants. Upright sprinklers in unfinished areas shall be laid out in a grid pattern, adhering to NFPA-13 requirements for Ordinary Hazard Occupancy, with a density of 0.15 GPM/sq. ft. and a maximum coverage of 130 sq. ft. per sprinkler head.

Mechanical (HVAC) Construction (MC) Contract No. 003
Reference M-2.3, M-2.6 and M-5.4 and all related drawings and specifications.Deduct three variable air volume boxes (VAV-2-11, VAV-2-12, VAV-2-13), and associated space temperature sensors, supply air ductwork, and hot water piping. Remove radiant heating panels serving the second floor and cap associated ¾” hot water piping with isolation valves for future use. Remove all
exhaust ductwork associated with second-floor restrooms that are no longer in the scope.
Retain VAV-2-10 with hot water reheat coil to serve the 214 Unoccupied Space and modify supply ductwork as

shown on drawing M2.6. Add three (3) hot water unit heaters with unit mounted thermostats and associated 1" hot water piping for heating of unoccupied space. Add one (1) 72x16" wall mounted return register as shown on drawings M2.3 and M2.6 for modified return air path to air-handling units (AHUs).

Electrical Construction (EC) Contract No. 004
Reference E-2.0, E-2.2, E-3.0, E-3.1, E-4.0, E-4.1, E-5.0, E-6.0 and E-7.1 and all related drawings and specifications. Deduct power, lighting and fire alarm from the second-floor spaces and elevator. The equipment room will be constructed. Add lighting, convenience receptacles and fire alarm for unfinished space.

DEDUCT $_____

4. Deduct: Install Elevator Shaft but Not the Elevator

NARRATIVE
Elevator Cab & Equipment omitted.

General Construction (GCC) Contract No. 001
Construct the elevator shaft, including the structural elements, walls, and access points. Infill Access point openings with a stud partition aligned with the outside face of the shaft and finish with gypsum wall board to be painted.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO DEDUCT

Mechanical (HVAC) Construction (MC) Contract No. 003 – NO DEDUCT

Electrical Construction (EC) Contract No. 004 – NO DEDUCT

DEDUCT $_____

5. Deduct: Omit Community Room, North Wall (Front Façade) Alterations

NARRATIVE
Community Room North wall is to remain as built.

General Construction (GCC) Contract No. 001
Eliminate Community Room North wall alterations including structural steel, rain screen panels and new windows. Existing exterior wall assembly of the Community Room North Wall will remain with this Alternate. Install Interior furring as noted on plans unless Deduct 5 is selected. Window Replacement Project: SED#50-03-08-03-6-005-007 is not omitted with this Alternate.

Plumbing and Fire Protection Construction (P&FC) Contract 002 - NO DEDUCT

Mechanical (HVAC) Construction (MC) Contract 003 – NO DEDUCT

Electrical Construction (EC) Contract No. 004 – NO DEDUCT

DEDUCT $_____

6. Deduct: Omit Community Room Motorized Partition and Supporting Structure

NARRATIVE
Motorized Bi-fold partition in Community Room to be Omitted

General Construction (GCC) Contract No. 001
Reference A620, Details 1/A620, 3/A620, 8/A620 and 19/A620 to be omitted. This omits the construction of the partition storage closet and supporting steel structure in the Community Room. Dropped Gypsum Board soffit intended to conceal steel beam and partition track to be framed level with the acoustical tile ceiling system.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003 - NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
Reference E3.0 and all related drawings and specifications for the omission of the (2) two key operated, tamper proof, constant pressure control stations and section divider controller for the motorized partition. Omit any related requirements for motor installation.

ADD: $_____

I. General Construction (GCC) CONTRACT NO. 001:

1. Unit Prices (only applicable unit prices are listed):

Unit Price No.	Item	Unit of Measure	Unit Price Add	Unit Price Deduct
1	Trench Rock Excavation	Cubic Yard		
2	Bulk Rock Excavation	Cubic Yard		
3	Exterior Bulk Excavation	Cubic Yard		
4	Exterior Trench and Culvert Excavation	Cubic Yard		
5	Replacement of Unsuitable On-Site Materials			
6	Utilities Excavation	Linear Foot		
7	Cast-In-Place Concrete	Cubic Yard		
8	Concrete Slab-On-Grade	Square Foot		
9	Concrete Slab-On-Metal Deck	Square Foot		
10	Structural Steel	Pounds		
11	Metal Decking	Per Square Foot		
12	Access Door & Frame at GWB Wall or Ceiling	Installed per door		
13	Fire Access Door & Frame at GWB	Installed per door		

	Wall or Ceiling			

2. **Allowances: $350,000.00 to be included in the Lump Sum Base Bid.**
3. Schedule of Values *(for Bid Evaluation Only)*:

General Construction (GCC) CONTRACT NO. 001 Base Bid lump sum amount

Description of Work	Amount	Description of Work	Amount
General Conditions		Firestopping, Sealants and Caulking	
Bonds and Insurance		Aluminum Windows and Storefront	
Mobilization/Temporary Facilities		Skylight	
Demolition		Interior Glass and Glazing	
Hazmat Abatement		Hollow Metal Frames and Doors	
Site Work		Aluminum Frames and Doors	
Survey/Shop Drawings		Hardware	
Cutting and Patching		Access Doors	
Concrete Foundations		Drywall & Accessories	
Concrete Slabs		Acoustical Ceilings	
Masonry		Finish Flooring (carpet, VCT, etc)	
Metal Fabrications		Ceramic Tile (Floors, Base & wall)	
Roofing & Roof Specialties		Painting	
Rough Carpentry		Specialties – Division 10	
Millwork		Equipment- Division 11	
Finish Carpentry		Furnishings – Division 12	
Insulation and Waterproofing		Special Construction - Division 13	
Roofing Access. & Sheet Metal		Conveying System	
		Allowance	$350,000.00
		Total (must be equal to Base Bid Amount)	

J. EXECUTION

1. The undersigned Bidder will accomplish all work required by the Bidding Documents and will provide Substantial Completion within 523 calendar days from the Contract signing, and will provide the Project, ready for final acceptance, inclusive of all Punch List and Project Close Out Documents within 611 calendar days from the Contract signing.

2. The undersigned hereby certifies that he/she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.

3. Enclosed herewith, is the Bid Security in the form of:

Bid Bond ( ) Certified Check ( )

in the amount of Dollars.

Indicate if the Bidder is a sole proprietor, partnership, corporation, or other legal entity.

Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

Bidder's signature: _____

Title: _____

Date: _____

SEAL (if bid is a corporation)

Acknowledgement by Contractor, if a corporation.

State of New York

County of:

On this ____ day of _____, 2025, before me personally came _____._____, and known to me, who, being sworn, did depose and say that he/she resides in the _____:
that he/she is the_____ of the _____,
a body corporate and the corporation described in and which erected the foregoing instruments; that he/she know the seal of said corporation; that the seal affixed to said instrument is such corporate seal; and that it was so affixed

by order of said corporation; and that he/she signed his name thereto by like order.

NOTARY PUBLIC: _____

Seal

SECTION 00 41 00.02
FORM OF PROPOSAL

1.1 INFORMATION

A. Bid presented to: Mr. Edward Falcone, Interim Library Director, Pearl River Public Library, 80 Franklin Avenue, Pearl River, NY 10965 and endorsed "Pearl River Public Library – Complete Renovation".

B. Bid presented by:

a. **Legal name, address, Phone # and Email of Bidder:**

_____

_____

_____

C. Bid presented for: "Pearl River Public Library – Complete Renovation" 80 Franklin Avenue, Pearl River, NY 10965

TRADE: Plumbing and Fire Protection Construction (P&FC) Contract No. 002

D. The bidder by making a bid represents that:

a. The Bidder has read and understands the Bidding Documents titled "Pearl River Public Library – Complete Renovation", Pearl River Public Library and the Bid is made in accordance therewith.

b. The Bidder has read and understands the Bidding Documents and Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

c. The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidders personal observations with the requirements of the proposed Contract Documents.

d. The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.

E. Addenda:

a. The Bidder acknowledges receiving all Addenda and including their provisions in the Bid.

b. Indicate the Addenda numbers received: **Addendum Numbers and Dates Received**

F. Bid:

a. The Bidder proposes to perform the Work for the following lump sum amount:

For NYSED Control # 50-03-08-03-6-005-004 – CHILLER REPLACEMENT
For NYSED Control # 50-03-08-03-6-005-005 – RESTROOM RENOVATION
For NYSED Control # 50-03-08-03-6-005-006 – COMPLETE RENOVATION
For NYSED Control # 50-03-08-03-6-005-007 – WINDOW REPLACEMENT

BASE BID Lump Sum Amount to include **ALLOWANCE of ($100,000.00):**

$_____(Numerical amount)

_____Dollars(Written amount)

b. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-004 – CHILLER REPLACEMENT

$_____(Numerical amount)

_____Dollars(Written amount)

c. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-005 – RESTROOM RENOVATION

$_____(Numerical amount)

_____Dollars(Written amount)

d. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-006 – COMPLETE RENOVATION

$_____(Numerical amount)

_____Dollars(Written amount)

e. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-007 – WINDOW REPLACEMENT

$_____(Numerical amount)

_____Dollars(Written amount)

G. Complete the following applicable page(s) and the final page "Execution" paragraph:

H. Alternates:

1 a. Add: Electric Service Conduit and Wiring

Narrative: Excavate trenches through the existing concrete slab from the mechanical room to the exterior wall. When install of new electrical conduits and wiring within the trenches is complete. Backfill, compact and patch trench with new concrete per architectural details. On the exterior, excavate a trench to connect to the transformer. When complete backfill, compact and patch affect concrete or asphalt. Refer to the electrical narrative for detailed information on conduit and wiring replacement.

ADD: $_____

1 b. Add: Electric Service Wiring

Narrative: Install new electrical wiring within existing conduit. Refer to the electrical narrative for detailed information on wiring replacement.

ADD: $_____

2. Add: Floor 1 Conference Rooms as Shown on Sheet A 161

Narrative: Construct new conference rooms on the first floor as depicted on Sheet A 161. This will involve installing glass aluminum framed partitions spanning up to the 13'-0" ceiling. Create stud partitions between each room to define the separate spaces. Refer to the electrical and mechanical narratives for detailed information on the required electrical outlets, lighting fixtures, HVAC systems, and other mechanical components within the conference rooms.

ADD: $_____

3. Deduct: Leave Second Floor Unfinished, Only Equipment Room Included in Scope

Narrative: Retain the second floor in an unfinished state, leaving the concrete slab expansion, stair infill, and lightweight concrete leveling in place. Only the equipment room will be completed as per the original plans. All other finishes will be eliminated like flooring, ceilings, and other interior walls on the second floor. Install a full height wall at Guard rail locations finished with painted gypsum on either side.

DEDUCT $_____

4. Deduct: Install Elevator Shaft but Not the Elevator

Narrative: Construct the elevator shaft, including the structural elements, walls, and access points. However, it excludes the installation of the actual elevator machinery and cab. Infill Access point openings with a stud partition aligned with the outside face of the shaft and finish with gypsum wall board to be painted.

DEDUCT $_____

5. Deduct: Leave Interior Perimeter Walls in Lieu of Upgrades to Insulation and Air Barrier

Narrative: Retain the existing interior perimeter walls instead of upgrading them with furred wall with improved insulation and air barrier materials. All in-wall components to remain. Walls to be refinished as noted in the finish schedule. Window Replacement Project: SED #50-03-08-03-6-005-007 to remain in main project.

DEDUCT $_____

6. Deduct: Omit Front Facade Window Replacement

Narrative: Eliminate the installation of the new windows, structural steel and rain screen panels on the North Facade of the building. Exterior wall assembly will remain as a brick façade. Install Interior furring as noted on plans unless Deduct 5 is selected.

DEDUCT $_____

I. Plumbing and Fire Protection Construction (P&FC) CONTRACT NO. 2:

1. Unit Prices (only applicable unit prices are listed):

Unit Price No.	Item for Plumbing Work	Unit of Measure	Unit Price Add	Unit Price Deduct
1	FIXTURES:	Each		
2	Water Closet	Each		
3	Urinal	Each		
4	Lavatory	Each		
5	Drinking Fountain	Each		
6	Mop Sink Basin	Each		
7	Floor Drain	Each		
8	Roof Drain	Each		
9	Wall Hydrant	Each		
10	Hose Bibb	Each		
11	Emergency Eye Wash	Each		
12	RPZ Assembly	Each		
13	General Laborer	Straight time/OT		
14	Plumber	Straight time/OT		
15	Insulator	Straight time/OT		
Unit Price No.	Item for Fire Protection Work	Unit of Measure	Unit Price Add	Unit Price Deduct
1	Pendant Concealed Sprinkler Head	Each		
2	Pendant Exposed Sprinkler Head	Each		
3	Upright Sprinkler Head	Each		
4	Sidewall Sprinkler Head	Each		
5	Tamper Switch	Each		
6	Flow Switch	Each		
7	General Laborer	Straight time/OT		
8	Steamfitter	Straight time/OT		
9	Insulator	Straight time/OT		

2. Allowances: $100,000.00 to be included in the Lump Sum Base Bid.

3. Schedule of Values (for Bid Evaluation Only):

   Plumbing and Fire Protection Construction (P&FC) CONTRACT NO. 2 Base Bid lump sum amount

Description of Work- Plumbing	Amount	Description of Work - Plumbing	Amount
General Conditions		Water Heaters	
Bonds and Insurance		Plumbing Identification	
Mobilization/Temporary Facilities		Emerg. Shower/Eye Wash Equipment	
Shop Drawings		Equipment Pads & Supports	
Cutting and Patching		Trenching/Backfill	
Pipe and Fittings		Punchlist	
Fixtures		Close-out	
Insulation		Others (specify below):	
Access Doors			
Storm Water Piping		Overhead & Profit	
Sanitary Waste & Vent Piping			
Cold, Hot & Recirculation Piping			
Description of Work - Fire Protection	Amount	Description of Work – Fire Protection	Amount
General Conditions		Access Doors	
Bonds and Insurance		Sprinkler Systems	
Mobilization/Temporary Facilities		Equipment Pads & Supports	
Shop Drawings		Trenching/Backfill	
Cutting and Patching		Punchlist	
Pipe and Fittings		Close-out	
Fixtures		Others (specify below):	
Insulation			
		Overhead & Profit	
		Allowance	$100,000.00
		Total (must be equal to Base Bid Amount)	

J. EXECUTION

1. The undersigned Bidder will accomplish all work required by the Bidding Documents and will provide Substantial Completion within 523 calendar days from the Contract signing, and will provide the Project, ready for final acceptance, inclusive of all Punch List and Project Close Out Documents within 611 calendar days from the Contract signing.
2. The undersigned hereby certifies that he/she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.
3. Enclosed herewith, is the Bid Security in the form of:

   Bid Bond( ) Certified Check ( )

   in the amount of _____ Dollars.

Indicate if the Bidder is a sole proprietor, partnership, corporation, or other legal entity.

Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

Bidder's signature: _____

Title: _____

Date: _____

SEAL (if bid is a corporation)

Acknowledgement by Contractor, if a corporation.

State of New York

County of:

On this ____ day of _____, 2022, before me personally came
_____._____,
to me know and known and known to me, who, being sworn, did depose and say that he/she resides in the _____:
that he/she is the_____ of the _____,
a body corporate and the corporation described in and which erected the foregoing instruments; that he/she know the seal of said corporation; that the seal affixed to said instrument is such corporate seal; and that it was so affixed by order of said corporation; and that he/she signed his name thereto by like order.

NOTARY PUBLC:_____

Seal

SECTION 00 41 00.03
FORM OF PROPOSAL

1.1 INFORMATION

A. Bid presented to: Mr. Edward Falcone, Interim Library Director, Pearl River Public Library, 80 Franklin Avenue, Pearl River, NY 10965 and endorsed "Pearl River Public Library – Complete Renovation".

B. Bid presented by:

a. **Legal name, address, Phone # and Email of Bidder:**

_____

_____

_____

C. Bid presented for: "Pearl River Public Library – Complete Renovation" 80 Franklin Avenue, Pearl River, NY 10965

TRADE: Mechanical (HVAC) Construction (MC) Contract No. 003

D. The bidder by making a bid represents that:

a. The Bidder has read and understands the Bidding Documents titled "Pearl River Public Library – Complete Renovation", Pearl River Public Library and the Bid is made in accordance therewith.

b. The Bidder has read and understands the Bidding Documents and Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

c. The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidders personal observations with the requirements of the proposed Contract Documents.

d. The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.

E. Addenda:

a. The Bidder acknowledges receiving all Addenda and including their provisions in the Bid.

b. Indicate the Addenda numbers received: **Addendum Numbers and Dates Received**

F. Bid:

a. The Bidder proposes to perform the Work for the following lump sum amount:

For NYSED Control # 50-03-08-03-6-005-004 – CHILLER REPLACEMENT
For NYSED Control # 50-03-08-03-6-005-005 – RESTROOM RENOVATION
For NYSED Control # 50-03-08-03-6-005-006 – COMPLETE RENOVATION
For NYSED Control # 50-03-08-03-6-005-007 – WINDOW REPLACEMENT

BASE BID Lump Sum Amount to include **ALLOWANCE of ($300,000.00):**

$_____(Numerical amount)

_____Dollars(Written amount)

b. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-004 – CHILLER REPLACEMENT

$_____(Numerical amount)

_____Dollars(Written amount)

c. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-005 – RESTROOM RENOVATION

$_____(Numerical amount)

_____Dollars(Written amount)

d. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-006 – COMPLETE RENOVATION

$_____(Numerical amount)

_____Dollars(Written amount)

e. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-007 – WINDOW REPLACEMENT

$_____(Numerical amount)

_____Dollars(Written amount)

G. Complete the following applicable page(s) and the final page "Execution" paragraph:

H. Alternates:

1. Add: Conference Rooms Shown on Sheet A 161

NARRATIVE
Addition of five (5) small Conference Rooms.

General Construction (GCC) Contract No. 001
Reference A161 and all related drawings and specifications. Construct conference rooms as depicted. Stud partitions between rooms, outer partition(s) and doors to be Aluminum framed glass.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003
Reference M2.2 and all related drawings and specifications for detailed information on the required HVAC and other mechanical components required for this Alternate.

Electrical Construction (EC) Contract No. 004
Reference E2.0, E3.0, E4.0, and all related drawings and specifications for detailed information on the required electrical outlets, lighting fixtures and other wiring/cable required for this Alternate.

ADD: $_____

2 a. Add: Electric Service Conduit and Wiring

NARRATIVE
New, below grade/embedded conduit and new electrical service wiring.

General Construction (GCC) Contract No. 001
Reference A020, E7.0, S-501.00 and all related drawings and specifications.
Excavate trenches at existing interior concrete slab for installation of new conduit and wiring.
Excavate exterior concrete slab and asphalt at the parking lot with trench for installation of new conduit and wiring. Coordinate with EC installation for backfill, compact and cover/patch trenched areas with new level concrete slab, per details provided – prior to backfill, allow PE to inspect.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003 – NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
Reference A020, E7.0, S-501.00 and all related drawings and specifications.
Refer to the electrical drawings and specifications for detailed information on conduit and wiring replacement. Install new conduit and new wiring from transformer to service panels at the Mechanical Room.

ADD: $_____

2 b. Add: Electric Service Wiring

NARRATIVE

New electrical service wiring within existing below grade/embedded conduit.

General Construction (GCC) Contract No. 001 - NO ADDITIONAL WORK

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003 – NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
Refer to the electrical scope and all related drawings and specifications for the detailed information on wiring replacement required for this Alternate.

ADD: $_____

3. Deduct: Unfinished Second Floor with Equipment Room, Closet, and Secure Storage Room

NARRATIVE
Open stair, landings, Elevator, Plumbing, Walls and Doors of expanded Second Floor Area omitted.

General Construction (GCC) Contract No. 001
Expanded Second Floor to be partially unfinished. Equipment Room including Secure Storage Room partitions, openings, and equipment required therein will be completed as per the original plans. Other rooms and restrooms will not be built at the expanded Second Floor. At perimeter of expanded Second Floor area, install a full height wall as shown on base plans, finished with painted gypsum on either side.

NOTE: Guard rails at the expanded Second Floor are omitted with this Alternate.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002
Reference P-0.1, P-2.1, P-2.2, P-5.1, SP-2.1, SP-2 and all related drawings and specifications.
All plumbing work within Toilet Rooms 204 and 205 shall be excluded from the scope. This includes the routing of domestic cold and hot water, sanitary, and vent pipes to the toilets, lavatories, and floor drains. Additionally, elevator sump pump ESP-1 and associate pump discharge piping shall be excluded from the scope.

The sprinklers of the unfinished Second Floor shall be exposed upright types instead of concealed pendants. Upright sprinklers in unfinished areas shall be laid out in a grid pattern, adhering to NFPA-13 requirements for Ordinary Hazard Occupancy, with a density of 0.15 GPM/sq. ft. and a maximum coverage of 130 sq. ft. per sprinkler head.

Mechanical (HVAC) Construction (MC) Contract No. 003
Reference M-2.3, M-2.6 and M-5.4 and all related drawings and specifications.Deduct three variable air volume boxes (VAV-2-11, VAV-2-12, VAV-2-13), and associated space temperature sensors, supply air ductwork, and hot water piping. Remove radiant heating panels serving the second floor and cap associated ¾” hot water piping with isolation valves for future use. Remove all exhaust ductwork associated with second-floor restrooms that are no longer in the scope.
Retain VAV-2-10 with hot water reheat coil to serve the 214 Unoccupied Space and modify supply ductwork as shown on drawing M2.6. Add three (3) hot water unit heaters with unit mounted thermostats and associated 1” hot water piping for heating of unoccupied space. Add one (1) 72x16” wall mounted return register as shown on drawings M2.3 and M2.6 for modified return air path to air-handling units (AHUs).

Electrical Construction (EC) Contract No. 004

Reference E-2.0, E-2.2, E-3.0, E-3.1, E-4.0, E-4.1, E-5.0, E-6.0 and E-7.1 and all related drawings and specifications. Deduct power, lighting and fire alarm from the second-floor spaces and elevator. The equipment room will be constructed. Add lighting, convenience receptacles and fire alarm for unfinished space.

DEDUCT $_____

4. Deduct: Install Elevator Shaft but Not the Elevator

NARRATIVE
Elevator Cab & Equipment omitted.

General Construction (GCC) Contract No. 001
Construct the elevator shaft, including the structural elements, walls, and access points. Infill Access point openings with a stud partition aligned with the outside face of the shaft and finish with gypsum wall board to be painted.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO DEDUCT

Mechanical (HVAC) Construction (MC) Contract No. 003 – NO DEDUCT

Electrical Construction (EC) Contract No. 004 – NO DEDUCT

DEDUCT $_____

5. Deduct: Omit Community Room, North Wall (Front Façade) Alterations

NARRATIVE
Community Room North wall is to remain as built.

General Construction (GCC) Contract No. 001
Eliminate Community Room North wall alterations including structural steel, rain screen panels and new windows. Existing exterior wall assembly of the Community Room North Wall will remain with this
Alternate. Install Interior furring as noted on plans unless Deduct 5 is selected. Window Replacement Project: SED#50-03-08-03-6-005-007 is not omitted with this Alternate.

Plumbing and Fire Protection Construction (P&FC) Contract 002 - NO DEDUCT

Mechanical (HVAC) Construction (MC) Contract 003 – NO DEDUCT

Electrical Construction (EC) Contract No. 004 – NO DEDUCT

DEDUCT $_____

6. Deduct: Omit Community Room Motorized Partition and Supporting Structure

NARRATIVE
Motorized Bi-fold partition in Community Room to be Omitted

General Construction (GCC) Contract No. 001
Reference A620, Details 1/A620, 3/A620, 8/A620 and 19/A620 to be omitted. This omits the construction of the partition storage closet and supporting steel structure in the Community Room. Dropped Gypsum Board soffit intended to conceal steel beam and partition track to be framed level with the acoustical tile ceiling system.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003 - NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
Reference E3.0 and all related drawings and specifications for the omission of the (2) two key operated, tamper proof, constant pressure control stations and section divider controller for the motorized partition. Omit any related requirements for motor installation.

I. Mechanical (HVAC) Construction (MC) CONTRACT NO. 3:

1. Unit Prices (only applicable unit prices are listed):

Unit Price No.	Item	Unit of Measure	Unit Price Add	Unit Price Deduct
1	Galvanized Ductwork	Pounds		
2	Plenum Ductwork	Pounds		
3	Fire-Smoke Damper	Square Foot		
4	Volume Damper	Each		
5	100-500cfm Fancoils	Each		
6	Unit Heater	Each		
7	Condensate Pump	Each		
8	Thermostat	Each		
9	Relay	Each		
10	Temperature Sensor	Each		
11	Control Valve (1/2” to 4”)	Each		
12	Motorized Damper	Each		
13	General Laborer	Straight time/OT		
14	Steamfitter	Straight time/OT		
15	Sheet Metal Mechanic	Straight time/OT		
16	Insulator	Straight time/OT		
17	Controls Technician	Straight time/OT		
18	Draftsperson	Straight time/OT		
19	Diffuser, Grille	Each		
20	Roof Penetration to 2sf	Each		
21	Housekeeping Pad	Square Foot		
22	Roof Curb	Each		

2. Allowances: $300,000.00 to be included in the Lump Sum Base Bid.

3. Schedule of Values (for Bid Evaluation Only):

Mechanical (HVAC) Construction (MC) CONTRACT NO. 3 Base Bid lump sum amount

Description of Work	Amount	Description of Work	Amount
Bonds and Insurance		Heat Exchangers.	
Mobilization/Temporary Facilities		Starters	
Shop Drawings		Sound Traps	
Cutting and Patching		Painting & Identification	
Radiation & Convectors		Chemical Treatment	
Pumps and Equipment		Refrigerant Monitoring System	
Cabinet/Unit Heaters		Equipment Pads & Supports	
Access Doors		Trenching/ Backfill	
Ductwork and Accessories		Punchlist	
Insulation		Close-out	
Registers, Grilles & VAV Boxes		Others (specify below)	
Controls and Instrumentation			
Testing, Adjusting & Balancing			
Pipes, Fittings & Hangers -Chilled		Overhead & Profit	
Pipes, fittings, and hangers			
Chilled and Hot Water			
Air Handlers, Fans, and Unit		Allowance	$200,000.00
		Total (must be equal to Base Bid Amount)	

J. EXECUTION

1. The undersigned Bidder will accomplish all work required by the Bidding Documents and will provide Substantial Completion within 523 calendar days from the Contract signing, and will provide the Project, ready for final acceptance, inclusive of all Punch List and Project Close Out Documents within 611 calendar days from the Contract signing.
2. The undersigned hereby certifies that he/she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.
3. Enclosed herewith, is the Bid Security in the form of:

Bid Bond ( ) Certified Check ( )

in the amount of _____ Dollars.

Indicate if the Bidder is a sole proprietor, partnership, corporation, or other legal entity.

Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

Bidder's signature: _____

Title: _____

Date: _____

SEAL (if bid is a corporation)

Acknowledgement by Contractor, if a corporation.

State of New York

County of:

On this ____ day of _____, 2025, before me personally came _____._____, and known to me, who, being sworn, did depose and say that he/she resides in the _____:
that he/she is the_____ of the _____,
a body corporate and the corporation described in and which erected the foregoing instruments; that he/she know the seal of said corporation; that the seal affixed to said instrument is such corporate seal; and that it was so affixed by order of said corporation; and that he/she signed his name thereto by like order.

NOTARY PUBLIC: _____

Seal

SECTION 00 41 00.04
FORM OF PROPOSAL

1.1 INFORMATION

A. Bid presented to: Mr. Edward Falcone, Interim Library Director, Pearl River Public Library, 80 Franklin Avenue, Pearl River, NY 10965 and endorsed "Pearl River Public Library – Complete Renovation".

B. Bid presented by:

a. **Legal name, address, Phone # and Email of Bidder:**

_____

_____

_____

C. Bid presented for: "Pearl River Public Library – Complete Renovation" 80 Franklin Avenue, Pearl River, NY 10965

TRADE: Electrical Construction (EC) Contract No. 004

D. The bidder by making a bid represents that:

a. The Bidder has read and understands the Bidding Documents titled "Pearl River Public Library – Complete Renovation", Pearl River Public Library and the Bid is made in accordance therewith.

b. The Bidder has read and understands the Bidding Documents and Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

c. The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidders personal observations with the requirements of the proposed Contract Documents.

d. The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.

E. Addenda:

a. The Bidder acknowledges receiving all Addenda and including their provisions in the Bid.

b. Indicate the Addenda numbers received: **Addendum Numbers and Dates Received**

F. Bid:

a. The Bidder proposes to perform the Work for the following lump sum amount:

For NYSED Control # 50-03-08-03-6-005-004 – CHILLER REPLACEMENT
For NYSED Control # 50-03-08-03-6-005-005 – RESTROOM RENOVATION
For NYSED Control # 50-03-08-03-6-005-006 – COMPLETE RENOVATION
For NYSED Control # 50-03-08-03-6-005-007 – WINDOW REPLACEMENT

BASE BID Lump Sum Amount to include ALLOWANCE of ($250,000.00):

$_____(Numerical amount)

_____Dollars(Written amount)

b. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-004 – CHILLER REPLACEMENT

$_____(Numerical amount)

_____Dollars(Written amount)

c. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-005 – RESTROOM RENOVATION

$_____(Numerical amount)

_____Dollars(Written amount)

d. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-006 – COMPLETE RENOVATION

$_____(Numerical amount)

_____Dollars(Written amount)

e. Breakdown Amount for the following bid packages:

For NYSED Control # 50-03-08-03-6-005-007 – WINDOW REPLACEMENT

$_____(Numerical amount)

_____Dollars(Written amount)

G. Complete the following applicable page(s) and the final page “Execution” paragraph:

H. Alternates:

1. Add: Conference Rooms Shown on Sheet A 161

NARRATIVE
Addition of five (5) small Conference Rooms.

General Construction (GCC) Contract No. 001
Reference A161 and all related drawings and specifications. Construct conference rooms as depicted. Stud partitions between rooms, outer partition(s) and doors to be Aluminum framed glass.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003
Reference M2.2 and all related drawings and specifications for detailed information on the required HVAC and other mechanical components required for this Alternate.

Electrical Construction (EC) Contract No. 004
Reference E2.0, E3.0, E4.0, and all related drawings and specifications for detailed information on the required electrical outlets, lighting fixtures and other wiring/cable required for this Alternate.

ADD: $_____

2 a. Add: Electric Service Conduit and Wiring

NARRATIVE
New, below grade/embedded conduit and new electrical service wiring.

General Construction (GCC) Contract No. 001
Reference A020, E7.0, S-501.00 and all related drawings and specifications.
Excavate trenches at existing interior concrete slab for installation of new conduit and wiring.
Excavate exterior concrete slab and asphalt at the parking lot with trench for installation of new conduit and wiring. Coordinate with EC installation for backfill, compact and cover/patch trenched areas with new level concrete slab, per details provided – prior to backfill, allow PE to inspect.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003 – NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
Reference A020, E7.0, S-501.00 and all related drawings and specifications.
Refer to the electrical drawings and specifications for detailed information on conduit and wiring replacement. Install new conduit and new wiring from transformer to service panels at the Mechanical Room.

ADD: $_____

2 b. Add: Electric Service Wiring

NARRATIVE

New electrical service wiring within existing below grade/embedded conduit.

General Construction (GCC) Contract No. 001 - NO ADDITIONAL WORK

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003 – NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
Refer to the electrical scope and all related drawings and specifications for the detailed information on wiring replacement required for this Alternate.

ADD: $_____

3. Deduct: Unfinished Second Floor with Equipment Room, Closet, and Secure Storage Room

NARRATIVE
Open stair, landings, Elevator, Plumbing, Walls and Doors of expanded Second Floor Area omitted.

General Construction (GCC) Contract No. 001
Expanded Second Floor to be partially unfinished. Equipment Room including Secure Storage Room partitions, openings, and equipment required therein will be completed as per the original plans. Other rooms and restrooms will not be built at the expanded Second Floor. At perimeter of expanded Second Floor area, install a full height wall as shown on base plans, finished with painted gypsum on either side.

NOTE: Guard rails at the expanded Second Floor are omitted with this Alternate.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002
Reference P-0.1, P-2.1, P-2.2, P-5.1, SP-2.1, SP-2 and all related drawings and specifications.
All plumbing work within Toilet Rooms 204 and 205 shall be excluded from the scope. This includes the routing of domestic cold and hot water, sanitary, and vent pipes to the toilets, lavatories, and floor drains. Additionally, elevator sump pump ESP-1 and associate pump discharge piping shall be excluded from the scope.

The sprinklers of the unfinished Second Floor shall be exposed upright types instead of concealed pendants. Upright sprinklers in unfinished areas shall be laid out in a grid pattern, adhering to NFPA-13 requirements for Ordinary Hazard Occupancy, with a density of 0.15 GPM/sq. ft. and a maximum coverage of 130 sq. ft. per sprinkler head.

Mechanical (HVAC) Construction (MC) Contract No. 003
Reference M-2.3, M-2.6 and M-5.4 and all related drawings and specifications.Deduct three variable air volume boxes (VAV-2-11, VAV-2-12, VAV-2-13), and associated space temperature sensors, supply air ductwork, and hot water piping. Remove radiant heating panels serving the second floor and cap associated ¾” hot water piping with isolation valves for future use. Remove all exhaust ductwork associated with second-floor restrooms that are no longer in the scope.
Retain VAV-2-10 with hot water reheat coil to serve the 214 Unoccupied Space and modify supply ductwork as shown on drawing M2.6. Add three (3) hot water unit heaters with unit mounted thermostats and associated 1” hot water piping for heating of unoccupied space. Add one (1) 72x16” wall mounted return register as shown on drawings M2.3 and M2.6 for modified return air path to air-handling units (AHUs).

Electrical Construction (EC) Contract No. 004

Reference E-2.0, E-2.2, E-3.0, E-3.1, E-4.0, E-4.1, E-5.0, E-6.0 and E-7.1 and all related drawings and specifications. Deduct power, lighting and fire alarm from the second-floor spaces and elevator. The equipment room will be constructed. Add lighting, convenience receptacles and fire alarm for unfinished space.

DEDUCT $_____

4. Deduct: Install Elevator Shaft but Not the Elevator

NARRATIVE
Elevator Cab & Equipment omitted.

General Construction (GCC) Contract No. 001
Construct the elevator shaft, including the structural elements, walls, and access points. Infill Access point openings with a stud partition aligned with the outside face of the shaft and finish with gypsum wall board to be painted.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO DEDUCT

Mechanical (HVAC) Construction (MC) Contract No. 003 – NO DEDUCT

Electrical Construction (EC) Contract No. 004 – NO DEDUCT

DEDUCT $_____

5. Deduct: Omit Community Room, North Wall (Front Façade) Alterations

NARRATIVE
Community Room North wall is to remain as built.

General Construction (GCC) Contract No. 001
Eliminate Community Room North wall alterations including structural steel, rain screen panels and new windows. Existing exterior wall assembly of the Community Room North Wall will remain with this
Alternate. Install Interior furring as noted on plans unless Deduct 5 is selected. Window Replacement Project: SED#50-03-08-03-6-005-007 is not omitted with this Alternate.

Plumbing and Fire Protection Construction (P&FC) Contract 002 - NO DEDUCT

Mechanical (HVAC) Construction (MC) Contract 003 – NO DEDUCT

Electrical Construction (EC) Contract No. 004 – NO DEDUCT

DEDUCT $_____

6. Deduct: Omit Community Room Motorized Partition and Supporting Structure

NARRATIVE
Motorized Bi-fold partition in Community Room to be Omitted

General Construction (GCC) Contract No. 001
Reference A620, Details 1/A620, 3/A620, 8/A620 and 19/A620 to be omitted. This omits the construction of the partition storage closet and supporting steel structure in the Community Room. Dropped Gypsum Board soffit intended to conceal steel beam and partition track to be framed level with the acoustical tile ceiling system.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003 - NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
Reference E3.0 and all related drawings and specifications for the omission of the (2) two key operated, tamper proof, constant pressure control stations and section divider controller for the motorized partition. Omit any related requirements for motor installation.

I. Electrical Construction (EC) CONTRACT NO. 4:

1. Unit Prices (only applicable unit prices are listed):

Unit Price No.	Item	Unit of Measure	Unit Price Add	Unit Price Deduct
1	Duplex Receptacle	Each		
2	Line Voltage Lighting Switch	Each		
3	Low Voltage Lighting Switch	Each		
4	Vacancy Sensor	Each		
5	Light Fixture (each type)	Each		
6	Empty Conduit & Junction Box for Telecommunications	Per Drop		
7	Card Reader	Each		
8	Smoke Detector	Each		
9	Pull Station	Each		
10	Tamper Switch	Each		
11	Door Holder	Each		
12	Horn/Strobe	Each		
13	Heat Detector	Each		
14	Fire Alarm Control Module	Each		
15	Branch Circuit 2#12,1#12G-¾" C	Per 20 Feet		
16	2#10,1#10G-¾" C	Per 20 Feet		
17	4#10, 1#10G-3/4" C	Per 20 Feet		
18	5#10, 1#10G-3/4" C	Per 20 Feet		
19	Feeder	Linear Foot		
20	4#4,1#8G-1 ¼ " C	Linear Foot		
21	3#2,1#6G-2" C	Linear Foot		
22	4#4/0,1#2G-2.5"C	Linear Foot		

23	4#500mcm,1#350mcmG-3½" C	Each		
24	20A-1p breaker	Each		
25	30A-1p breaker	Each		
26	20A-2p breaker	Each		
27	30A-2p breaker	Each		
28	60A-3p breaker	Each		
29	80A-3p breaker	Each		
30	100A-3p breaker	Each		
31	150A-3p breaker	Each		
32	225A-3p breaker	At 550 Feet		
33	Difference between 2#8, 1#10G and 2#4, 1#8G	Linear Foot		
34	Fire Alarm Branch Wiring	Each		
35	30A-3p Fused Disconnect Switch	Each		
36	60A-3p Fused Disconnect Switch	Each		
37	100A-3p Fused Disconnect Switch	Each		
38	200A-3p Fused Disconnect Switch	Each		
39	300A-3p Fused Disconnect Switch	Each		

2. Allowances: $150,000.00 to be included in the Lump Sum Base Bid.

3. Schedule of Values (for Bid Evaluation Only):

Electrical Construction (EC) CONTRACT NO. 4 Base Bid lump sum amount

Description of Work	Amount	Description of Work	Amount
General Conditions		Fire Alarm	
Bonds and Insurance		Motor Controls	
Mobilization/Temporary Facilities		Lighting	
Shop Drawings		Equipment Pads & Supports	
Cutting and Patching		Trenching/Backfill	
Temporary Lighting & Power		Punchlist	
Electrical Service		Close-out	
Electrical Devices		Others(specify beow):	
Conduit & Electrical Boxes			
Wiring		Overhead and profit	
Panel Boards & Switches		Allowance	$150,000.00
		Total (must be equal to Base Bid Amount)	

J. EXECUTION

1. The undersigned Bidder will accomplish all work required by the Bidding Documents and will provide Substantial Completion within 523 calendar days from the Contract signing, and will provide the Project, ready for final acceptance, inclusive of all Punch List and Project Close Out Documents within 611 calendar days from the Contract signing.
2. The undersigned hereby certifies that he/she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.
3. Enclosed herewith, is the Bid Security in the form of:

Bid Bond ( ) Certified Check ( )

in the amount of _____ Dollars.

Indicate if the Bidder is a sole proprietor, partnership, corporation, or other legal entity.

Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

Bidder's signature: _____

Title: _____

Date: _____

SEAL (if bid is a corporation)

Acknowledgement by Contractor, if a corporation.

State of New York

County of:

On this ____ day of _____, 2025, before me personally came
_____._____,
to me know and known and known to me, who, being sworn, did depose and say that he/she resides in the _____:
that he/she is the_____ of the _____,
a body corporate and the corporation described in and which erected the foregoing instruments; that he/she know the seal of said corporation; that the seal affixed to said instrument is such corporate seal; and that it was so affixed by order of said corporation; and that he/she signed his name thereto by like order.

NOTARY PUBLC:_____

Seal

SECTION 004400
INSURANCE CERTIFICATION FORM

Your insurance representative and your company's representative must complete the form below in order to be considered for the award of this bid. Please note that a certificate of insurance must accompany your bid submission in order for your bid to be considered.

Insurance Representative's Acknowledgement:
We have reviewed the insurance requirements set forth in the bid package and are capable of providing such insurance to our insured in accordance with such requirements in the event the contract is awarded to our insured and provided our insured pays the appropriate premium.

Are you an agent for the companies providing the coverage? Yes_____ No_____
Date: _____
Insurance Company/Brokerage:_____
Mailing Address:_____
Phone:_____ Fax:_____
Email:_____
Agent Name:_____ Signature:_____

Bidder's Acknowledgement:
I acknowledge that I have received the insurance requirements of this bid and have considered the costs, if any, of procuring the required insurance and will be able to supply the insurance required in accordance with the bid, if it is awarded. I understand that a certificate of insurance must be submitted with my bid; and if it is not, the municipality may reject my bid and award to the next lowest bidder.

Firm Name:_____
Address:_____
Date:_____ Bidder's Signature:_____

SECTION 004500
NON-COLLUSION AFFIDAVIT FORM

As required by Section 139-d of the New York State Finance Law, the bidder certifies that:

(a) the bid has been arrived at by the bidder independently and has been submitted without collusion with any other vendor of materials, supplies, or equipment of the type described in the invitation for fids, and

(b) the contents of the bid have not been communicated by the bidder, nor, to its best knowledge and belief, by any of its employees or agents, to any person not an employee or agent of the bidder or its surety on any bond furnished herewith prior to the official opening of the bid. The signature of the Contractor to this contract shall be deemed a specific subscription to the certificate required pursuant to Section 139-d of the State of New York Finance Law and the Contractor affirms that the statements therein contained are true under the penalties of perjury.

(c) 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 for the award of this bid. Please note that a certificate of insurance must accompany your bid submission in order for your bid to be considered.

Signed:_____
By:_____
Date:_____

If a corporation, give the State of Incorporation, using the phrase "corporation organized under the laws of"

_____

If a partnership, give names of partners, using also the phrase "co-partners trading and doing business under the firm name and style of"

_____

If an individual using a trade name, give individual name, using also the phrase "an individual doing business under the firm name and style of"

_____

SECTION 004600
CERTIFICATE OF COMPLIANCE WITH THE IRAN DIVESTMENT ACT FORM

As a result of the Iran Divestment Act of 2012 (the "Act"), Chapter 1 of the 2012 Laws of New York, a new provision has been added to State Finance Law (SFL) Section 165-a and New York General Municipal Law Section 103-g, both effective April 12, 2012. Under the Act, the Commissioner of the Office of General Services (OGS) will be developing a list of "persons" who are engaged in "investment activities in Iran" (both are defined terms in the law) (the "Prohibited Entities List"). Pursuant to SFL Section 165-a(3)(b), the initial list is expected to be issued no later than 120 days after the Acts' effective date at which time it will be posted on the OGS website.

By submitting a bid in response to this solicitation or by assuming the responsibility of a Contract awarded hereunder, each Bidder/Contractor, any person signing on behalf of any Bidder/Contractor and any assignee or subcontractor and, in the case of a joint bid, each party thereto, certifies, under perjury, that once the Prohibited Entities List is posted on the OGS website, that to the best of its knowledge and belief, that each Bidder/Contractor and any subcontractor or assignee is not identified on the Prohibited Entities List created pursuant to SFL Section 165-a(3)(b).

Additionally, Bidder/Contractor is advised that once the Prohibited Entities List is posted on the OGS website, any Bidder/Contractor seeking to renew or extend a Contract or assume the responsibility of a Contract awarded in response to this solicitation must certify the Contract is renewed, extended or assigned that it is not included on the Prohibited Entities List.

During the term of the Contract, should the City (County, Town, or Municipality) receive information that a Bidder/Contractor is in violation of the above referenced certification, the City (County, Town or Municipality) will offer the person or entity an opportunity to respond. If the person or entity fails to demonstrate that he/she/it has ceased engagement in the investment which is in violation of the Act within 90 days after the determination of such violation, then the City (County, Town, or Municipality) shall take such action as may be appropriate including, but not limited to, imposing sanctions, seeking compliance, recovering damages or declaring the Bidder/Contractor in default.

The City (County, Town, or Municipality) reserves the right to reject any bid or request for assignment for a Bidder/Contractor that appears on the Prohibited Entities List prior to award of a contract and to pursue a responsibility review with respect to any Bidder/Contractor that is awarded a contract and subsequently appears on the Prohibited Entities List.

I,_____, being duly sworn, deposes ans says that he/she/it is the _____ of the _____ Corporation and that neither the Bidder/Contractor nor any proposed subcontractor is identified on the Prohibited Entities List.

Signed:_____

SWORN to before me this
_____day of _____ 20_____
Notary Public:_____

SECTION 004700
SEXUAL HARASSMENT PREVENTION CERTIFICATION FORM

By submission of this application, each applicant and each person signing on behalf of the applicant certifies, and in the case of a partnering application each party thereto certifies as to its own organization, under penalty of perjury, that the applicant has and has implemented a written policy addressing sexual harassment prevention in the workplace and provides annual sexual harassment prevention training to all of its employees. Such policy shall, at a minimum, meet the requirements of Section 201-g of the Labor Law.

Grantee Name:_____
Signature:_____
Print Name and Title:_____ _____
Date:_____

SECTION 004800
FORM OF MAINTENANCE BOND (TWO YEARS)

KNOW ALL MEN BY THESE PRESENTS:

That We, _____
_____(herinafter called the Principal)
as Principal and the _____, a_____Corporation with an office and place of business for the State of New York at _____, New York, (herinafter called the Surety) as Surety, are held and firmly bound unto the _____
_____
(hereinafter called the Obligee) as Obligee in the sum of _____
_____($_____) DOLLARS,
lawful money of the United States of America, for the payment whereof the Principal and Surety bind themselves, their successors and assigns, jointly and severally, firmly by these presents.

Signed, sealed and dated this _____day of_____, 20_____

WHEREAS, the Principal heretofore entered into a written contract with the Obligee for
_____
_____
_____

WHEREAS, said Contract provides that the Principal shall guarantee
_____
_____
_____

NOW, THEREFORE, the condition of this obligation is such, that if the above Principal shall indemnify the Obligee against loss by reason of his failure to make good at his own expense any defects or deficiencies in materials or workmanship which may appear in the work under said contract with the period of **TWO** year(s) from the date of acceptance of the work, then this obligation shall be void; othewise to remain in full force and effect.

_____
Principal

BY:_____
BY:_____

State of_____ County of_____

On this _____day of_____20___ before me personally appeared the within named_____to me know, and know to me to be_____the individual described in and who executed the within bond, and _____acknowledged to me that he_____executed the same.

_____

NOTARY PUBLIC

END OF SECTION

SECTION 005000
CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.1 Contractor is responsible for obtaining a valid license to use all copyrighted documents specified but not included in the Project Manual.

1.2 AGREEMENT AND CONDITIONS OF THE CONTRACT

A. See Section 005200 - Agreement Form for the Agreement form to be executed.

B. See Section 007200 - General Conditions for the General Conditions.

C. See Section 007300 - Supplementary Conditions for the Supplementary Conditions.

D. The Agreement is based on AIA A101.

E. The General Conditions are based on AIA A201.

1.3 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in Contract Documents.

B. Bond Forms:
1. Bid Bond Form: AIA A310.

C. Post-Award Certificates and Other Forms:
1. Submittal Transmittal Letter Form: AIA G810.
2. Schedule of Values Form: AIA G703.
3. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).

D. Clarification and Modification Forms:
1. Substitution Request Form: CSI/CSC Form 13.1A (After the Bidding/Negotiating Stage).
2. Architect's Supplemental Instructions Form: AIA G710.
3. Construction Change Directive Form: AIA G714.
4. Change Order Form: AIA G701.

E. Closeout Forms:
1. Certificate of Substantial Completion Form: AIA G704.
2. Contractor’s Affidavit of Release of Liens Form: AIA G706A
3. Consent of Surety to Final Payment Form: AIA G707.

1.4 REFERENCE STANDARDS

A. AIA A101 - Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum; 2017.

B. AIA A201 - General Conditions of the Contract for Construction; 2017.

C. AIA A310 - Bid Bond; 2010.

D. AIA G701 - Change Order; 2017.

E. AIA G702 - Application and Certificate for Payment; 1992.

F. AIA G703 - Continuation Sheet; 1992.

G. AIA G704 - Certificate of Substantial Completion; 2017.

H. AIA G706A - Contractor’s Affidavit of Release of Liens; 1994.

I. AIA G707 - Consent of Surety to Final Payment; 1994.

J. AIA G710 - Architect's Supplemental Instructions; 2017.

K. AIA G714 - Construction Change Directive; 2017.

L. AIA G810 - Transmittal Letter; 2001.

M. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 005200
AGREEMENT FORM

PART 1 GENERAL

1.1 FORM OF AGREEMENT

1.2 The Agreement to be executed is attached following this page.

1.3 RELATED REQUIREMENTS

A. Section 007200 - General Conditions.

B. Section 007300 - Supplementary Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

AIA® Document A132® – 2019

Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

AGREEMENT made as of the day of in the year 2025
(In words, indicate day, month, and year.)

BETWEEN the Owner:
(Name, legal status, address, and other information)

Pearl River Public Library
80 Franklin Avenue
Pearl River, New York 10965
(845) 735-4084

and the Contractor:
(Name, legal status, address, and other information)

for the following Project:
(Name, location, and detailed description)

Pearl River Public Library Renovation
80 Franklin Avenue
Pearl River, New York 10965

The Construction Manager:
(Name, legal status, address, and other information)

Calgi Construction Company, Inc.
56 Lafayette Avenue, Suite 350
White Plains, New York 10603

The Architect:
(Name, legal status, address, and other information)

Lothrop Associates Architects D.P.C.
333 Westchester Avenue
White Plains, New York 10604
(914) 741-1115

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in or reasonably inferable from the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others, in accordance with the skill, care, and diligence of a contractor experienced in constructing comparable public library renovation projects in New York State (the "Performance Expectations").

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[X] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:
(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

The Contractor shall perform the Work in accordance with the milestone schedule attached hereto as Exhibit C (the "Milestone Schedule") and shall achieve Substantial Completion on the date set forth in this Section 3.3.1. Following the award of the contract, the Contractor shall prepare and provide a project schedule for review and approval by the Owner, and following such review and approval, such project schedule shall replace the Milestone Schedule, and the parties shall enter into a Modification incorporating such approved project schedule into the Agreement.

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of all of the Contractors for the Project are to be completed prior to Substantial Completion of the entire Work of all of the Contractors for the Project, the Contractors shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date
See Exhibit C	

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:
(Check one of the following boxes and complete the necessary information.)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[X] By the following date: See Exhibit C

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete
See Exhibit C	

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
(Check the appropriate box.)

[X] Stipulated Sum, in accordance with Section 4.2 below

[ ] Cost of the Work plus the Contractor's Fee, in accordance with Section 4.3 below

[ ] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents, as is more specifically broken down in the price breakdown ("Price Breakdown") attached hereto as Exhibit D. Following the award of the contract, the Contractor shall prepare and provide a detailed schedule of values for review and approval by the Owner, and following such review and approval, such schedule of values shall replace the Price Breakdown, and the parties shall enter into a Modification incorporating such approved schedule of values into the Agreement.

§ 4.2.2 Alternates

§ 4.2.2.1 Alternates, if any, included in the Contract Sum:

Item	Price
See Exhibit D	

§ 4.2.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance
See Exhibit D		

§ 4.2.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price
See Exhibit D	

§ 4.2.4 Unit prices, if any:
(Identify the item and state the unit price, and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)
See Exhibit D		

§ 4.3 Cost of the Work Plus Contractor's Fee without a Guaranteed Maximum Price

§ 4.3.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.3.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

§ 4.3.3 The method of adjustment of the Contractor's Fee for changes in the Work:

§ 4.3.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed percent (%) of the standard rental rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:

(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager, within 14 days of executing this Agreement, a written Control Estimate for the Owner's review and approval. The Control Estimate shall include the items in Section B.1 of Exhibit B, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price

§ 4.4.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.4.2 The Contractor's Fee:

(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed percent (%) of the standard rental rate paid at the place of the Project.

§ 4.4.6 Unit Prices, if any:

(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.4.7 Guaranteed Maximum Price

§ 4.4.7.1 The Contract Sum is guaranteed by the Contractor not to exceed ($), subject to additions and deductions by Change Order as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.

§ 4.4.7.2 Alternates

§ 4.4.7.2.1 Alternates, if any, included in the Guaranteed Maximum Price:

Item	Price

§ 4.4.7.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.

(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.4.7.3 Allowances, if any, included in the Guaranteed Maximum Price:

(Identify each allowance.)

Item	Price

§ 4.4.7.4 Assumptions, if any, upon which the Guaranteed Maximum Price is based:
(Identify each assumption.)

§ 4.4.8 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes, or equipment, all of which, if required, shall be incorporated by Change Order.

§ 4.4.9 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 4.4.7.4. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 4.4.7.4 and the revised Contract Documents.

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any, to be assessed in accordance with Section 3.4.)

§ 4.5.1 The Contractor recognizes that achieving Substantial Completion of the Work on or before the date specified above/within the time period set forth above is a material condition of this Agreement, and that if the Contractor fails to achieve Substantial Completion of the Work on or before such date/within such period, Owner will incur damages as a result. The Owner and the Contractor agree that the amount of such damages is difficult to ascertain with any precision. The Contractor and the Owner have attempted to estimate reasonable daily figures for liquidated damages, not to penalize the Contractor for late completion, but to reasonably estimate probable losses and damages to the Owner in the event of late completion. In the event the Contractor does not achieve Substantial Completion of the Work on or before such date/within such period, the Contractor shall pay Owner, as liquidated damages and not as penalty [_____and NO/100 Dollars ($_____)] per day for each day or part thereof that the actual date of Substantial Completion of the Work extends beyond the specified date/period.

§ 4.5.2 The Contractor acknowledges that the liquidated damages amounts set forth in Section 4.5.1 above represents a fair and reasonable estimate of the Owner's probable losses, damage and /or expenses, and are not a penalty, for late completion of the Work and phases thereof.

§ 4.5.3 The Owner shall be entitled to offset any liquidated damages owed by the Contractor against any amounts owing by Owner to Contractor.

§ 4.6 Other:
(Insert provisions for bonus, cost savings or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Construction Manager by the Contractor, and Certificates for Payment issued by the Construction Manager and Architect, the Owner shall make progress payments on account of the Contract Sum, to the Contractor, as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month

§ 5.1.3 The Contractor shall provide to the Owner and Construction Manager each Application for Payment not later than the 1st day of each month. The Construction Manager and Architect shall review, approve, disapprove, or take other appropriate measures with respect to the Payment Application within twelve (12) days after receipt of the Application for Payment. The Owner shall make payment of the certified amount to the Contractor no later than thirty (30) days after receipt of the Construction Manager's certification. Applications for Payment that are not timely received shall be deemed received as of the next monthly cycle..

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment. Each Application for Payment shall be supported by data substantiating the Contractor's right to payment as the Owner or Construction Manager may reasonably require, such as evidence of payments made to, and waivers of liens from, subcontractors and suppliers. Further, each Application for Payment shall be accompanied by duly executed unconditional waivers of liens from Contractor and each Subcontractor for any amounts included in the previous month's Application for Payment and duly executed conditional waivers of liens from Contractor and each Subcontractor for any amounts included in the current Application for Payment, all in the form attached to this Agreement as Exhibit E.

§ 5.1.4.2 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.4.3.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.4.3.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit B, Determination of the Cost of the Work, along with payrolls, petty cash accounts, receipted invoices, or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor, plus payrolls for the period covered by the present Application for Payment, less that portion of the payments attributable to the Contractor's Fee.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the

period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 In accordance with AIA Document A232-2019 and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.5.3.1 The amount of each progress payment shall first include:

- **.1** The Cost of the Work as described in Exhibit B, Determination of the Cost of the Work;
- **.2** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and
- **.3** The Contractor's Fee computed upon the Cost of the Work described in the preceding Section 5.1.5.3.1.1 at the rate stated in Section 4.3.2; or if the Contractor's Fee is stated as a fixed sum in Section 4.3.2 an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work included in Section 5.1.5.3.1.1 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.5.3.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;
- **.5** The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.5.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and
- **.6** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor, and such action shall not be deemed to be a representation that (1) the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; (2) that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.5.6 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.5.7 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed Maximum Price

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in

accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Contractor's Fee.

§ 5.1.6.2.1 The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.6.2.2 The allocation of the Guaranteed Maximum Price under this Section 5.1.6.2 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

§ 5.1.6.2.3 When the Contractor allocates costs from a contingency to another line item in the schedule of values, the Contractor shall submit supporting documentation to the Architect and Construction Manager.

§ 5.1.6.3 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work and for which the Contractor has made payment or intends to make payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 In accordance with AIA Document A232-2019, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.4.1 The amount of each progress payment shall first include:

- **.1** That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;
- **.2** That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner, suitably stored off the site at a location agreed upon in writing;
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and
- **.4** The Contractor's Fee, computed upon the Cost of the Work described in the preceding Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.6.4.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;
- **.5** The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and
- **.6** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and such action shall not be deemed to be a representation that (1) the Construction Manager or Architect have made a detailed examination, audit, or arithmetic verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; (2) that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.6.7 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.6.8 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Five percent (5%).

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

N/A.

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

N/A.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7; provided, however, that the Owner shall have the right to withhold one hundred and fifty percent (150%) of any punch list work until it is completed. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

N/A.

§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

§ 5.2.1.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect.

§ 5.2.1.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final

Certificate for Payment or Project Certificate for Payment, or as follows:

N/A.

§ 5.2.2 Final Payment Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 5.2.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit B, Determination of the Cost of the Work and a final Application for Payment; and

.3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect in accordance with Exhibit B, Determination of the Cost of the Work.

§ 5.2.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

§ 5.3 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

The prime rate per annum for major money center banks as set forth in the Wall Street Journal on the date payment was due and payable.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Article 15 of AIA Document A232–2019.

[X] Litigation in a court of competent jurisdiction.

[ ] Other: *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent

jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

None. There shall be no termination penalty.

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 7.2.1 Termination

§ 7.2.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.2.1.2 Termination by the Owner for Cause

§ 7.2.1.2.1 If the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232–2019, the Owner shall then only pay the Contractor an amount as follows:

.1 Take the Cost of the Work incurred by the Contractor to the date of termination;

.2 Add the Contractor's Fee, computed upon the Cost of the Work to the date of termination at the rate stated in Section 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion;

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract the costs and damages incurred, or to be incurred, by the Owner under Article 14 of AIA Document A232–2019.

§ 7.2.1.2.2 When the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, if the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232-2019, the amount, if any, to be paid to the Contractor under Article 14 of AIA Document A232-2019 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.1.2.1.

§ 7.2.1.2.3 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Contractor will contain provisions allowing for assignment to the Owner as described above.

§ 7.2.1.3 Termination by the Owner for Convenience

If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.3 Suspension

The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term "profit" shall be understood to mean the Contractor's Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

Nancy Aravecz Shah
Library Director
75 East Central Avenue
Pearl River, New York 10965

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A132™–2019, Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Intentionally Omitted.

§ 8.7 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

§ 8.8 Other provisions:

§ 8.8.1 The Contractor shall include in the Contract Sum set forth in the schedule of values, all sales, tariffs, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted, whether or not yet effective, at the time this Agreement is executed. The schedule of values shall specifically include a line item for tariffs that are in effect as of the date this Agreement is executed. The Contractor shall pursue all tax exemptions for material and equipment purchases that the Owner is entitled to in accordance with the Owner's tax-exempt status.

§ 8.8.2 If any tariffs become effective after the date of this Agreement with respect to materials or equipment to be used as part of the Work, then the Contractor shall be entitled to an equitable adjustment in the Contract Sum to the extent the tariffs directly increase the cost of the material or equipment, provided, however, that (i) the Contractor shall bear the burden of proving the direct tariff impact on the cost of the material or equipment used in the Project, (ii) no adjustment shall exceed the actual amount of the tariff, (iii) the Contractor shall use commercially reasonable efforts to mitigate the impact of such tariffs, including proposing for the Owner's review and approval alternative materials and equipment that are not subject to tariffs, sourcing materials and equipment from countries that are not subject to tariffs or subject to lower tariff rates, phasing the Project in ways that would mitigate the tariffs' impact, (iv) the Contractor shall provide the Owner and the Construction Manager with such documentation (such as invoices, receipts, bills, comparison of costs before and after the imposition of tariffs) sufficient, in the Owner's discretion, to substantiate its entitlement to an increase in the Contract Sum, and (v) there shall be no increase in the Contract Sum until the Contractor has used up its contingency. Further, in the event tariffs previously imposed on materials or equipment to be used as part of the Work are reduced or eliminated, the Contract Sum shall be reduced to reflect such reduction or elimination.

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, as modified by the parties

.2 AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit, as modified by the parties

.3 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as modified by the parties.

.4 Building Information Modeling Exhibit, if completed:

.5 Drawings

Number	Title	Date
See Exhibit F		

.6 Specifications

Section	Title	Date	Pages
See Exhibit G			

.7 Addenda, if any:

Number	Date	Pages
See Exhibit H		

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[N/A] AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

[N/A] AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as

Adviser Edition, dated as indicated below:
(Insert the date of the E235-2019 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232–2019 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

Exhibit C – Milestone Schedule
Exhibit D- Price Breakdown
Exhibit E – Forms of Lien Waivers

This Agreement is entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

EXHIBIT C

Act ID	Responsibility	Description	Orig Dur	Rem Dur	Early Start	Early Finish
Start						
			0	0 *	03OCT22	03OCT22
1000		Project Start	0	0 *	03OCT22	
Referendum Phase						
			158d	158d	03OCT22	17MAY23
1010	**TEAM**	SEQR EAF Part I Identification Involved	1d	1d	03OCT22	03OCT22
1130		Completion of Referendum Phase	0	0		17MAY23
Pre-Construction Phase						
			557d	557d	17MAY23	29JUL25
1140	**TEAM**	Design Development Phase	62d	62d	17MAY23	14AUG23
1280	**TEAM**	Complete DD Phase	0	0		04MAR24
1290	**TEAM**	Construction Documents Phase	53d	53d	04MAR24	15MAY24
1410	**TEAM**	Complete CD Phase	0	0		05JUN24
1420	**NYSED**	SED Review & Approval-Architectural Review	130d	130d	05JUN24	09DEC24
1450	**NYSED**	Final Review & Issued Permit	11d	11d	13FEB25	28FEB25
1460	**LAA**	Final Bid Documents	10d	10d	05MAY25	16MAY25
1470	**TEAM**	Bidding Phase	21d	21d	19MAY25	17JUN25
1480	**TEAM**	Pre-Bid Meeting	1d	1d	04JUN25	04JUN25
1490	**TEAM**	Bids Due Date	1d	1d	17JUN25	17JUN25
1500	**TEAM**	Bid Analysis & Recommendation	6d	6d	18JUN25	25JUN25
1510	**PRPL**	PRPL - Approved & Award Contracts	3d	3d	26JUN25	30JUN25
1520	**CCC**	Contractor's Bond Insurance & Contracts	20d	20d	01JUL25	29JUL25
1530	**CCC**	RFP Material Testing & Inspection Services	15d	15d	01JUL25	22JUL25
1540		Completion of Pre-Construction Phase	0	0		29JUL25
Construction Phase						
			360d	360d	30JUL25	04JAN27
1550		Start of Construction Phase	0	0	30JUL25	
1560	**TEAM**	Pre Construction Meeting	1d	1d	30JUL25	30JUL25
1570	**TEAM**	Prime Contractors - Site Mobilization	10d	10d	31JUL25	13AUG25
1580	**TEAM**	Construction	355d	355d	06AUG25	04JAN27
1590	**C&A**	Commissioning	30d	30d	18NOV26	04JAN27
1600	**TEAM**	Substantial Completion	10d	10d	18NOV26	03DEC26
1610	**TEAM**	Punch List	22d	22d	02DEC26	04JAN27
1620	**TEAM**	Certificate of Occupancy	10d	10d	18DEC26	04JAN27
1630		Conpletion of Construction Phase	0	0		04JAN27
Post Construction Phase						
			20d	20d	04JAN27	29JAN27
1640		Start of Post Construction Phase	0	0	04JAN27	
1650	**TEAM**	Record Documents	20d	20d	04JAN27	29JAN27
1660		Completion of Post Construction Phase	0	0		29JAN27
1670		Project Completion	0	0		29JAN27

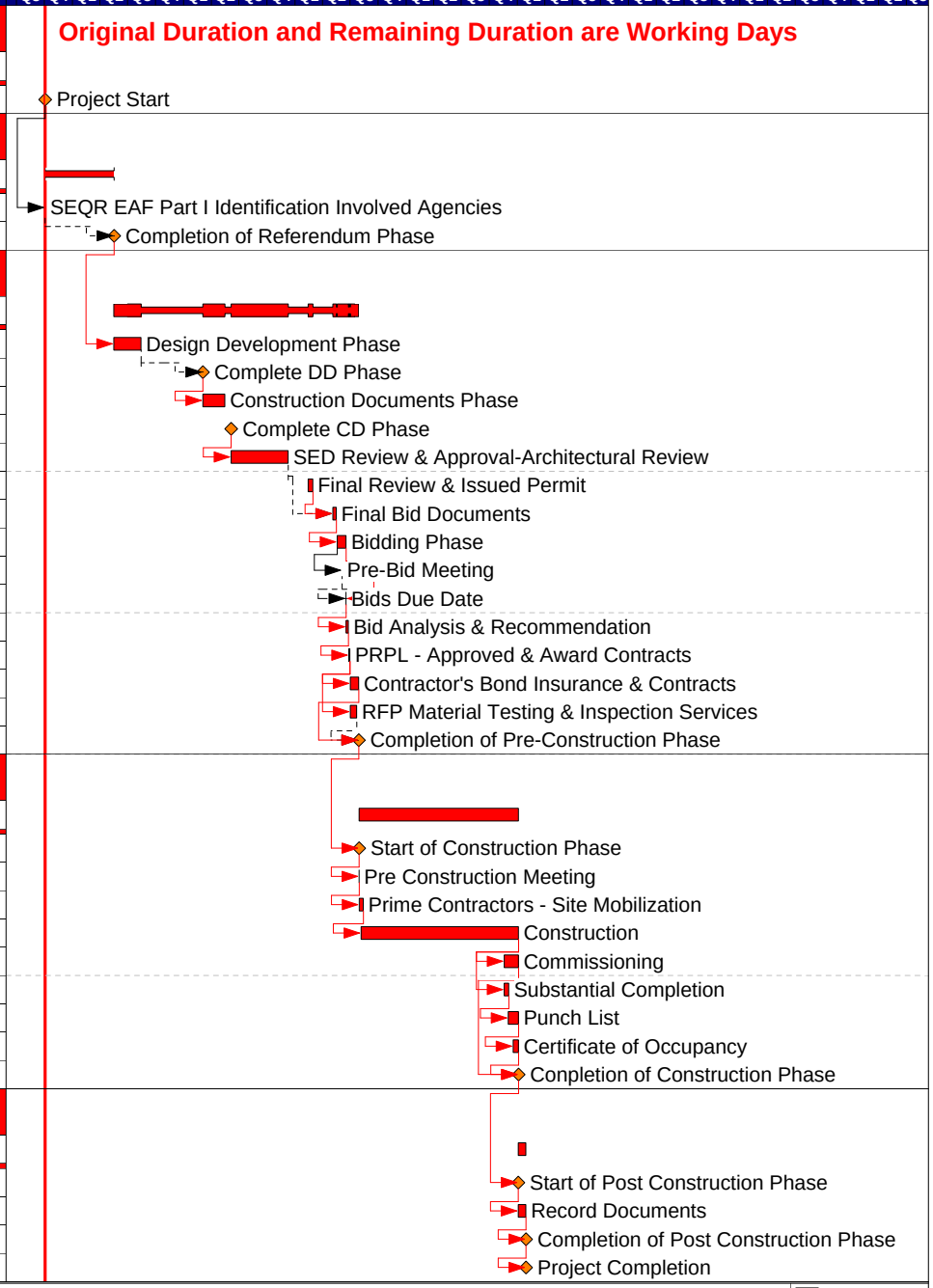

EXHIBIT E

CONDITIONAL WAIVER AND RELEASE OF LIEN UPON FINAL PAYMENT

TO WHOM IT MAY CONCERN:

CONTRACTOR NAME:_____

PROJECT NAME/PREMISES:_____

TYPE OF WORK AND/OR MATERIAL:_____

OWNER NAME:_____

The undersigned does hereby acknowledge, certify and warrant that the following statement of contract account is correct and complete to and including the date hereof, and that all charges and amounts now due to the undersigned and all charges and costs heretofore incurred by or for the undersigned for labor and materials in connection with the above described premises or improvements thereon have been paid in full (less retainage):

Statement of Contract Account

Original Contract Amount	$_____
Approved Change Orders	$_____
Total Revised Contract	$_____
Total Payments to Date (net of retainage /current request not included)	$_____
Total Amount of Retention Withheld:	$_____

Conditional Waiver and Release of Lien

The undersigned, for and in consideration of the final payment of $_____ for invoice No. ____, effective upon the Owner making payment on the invoice, does hereby conditionally waive and release any right which it now has or in the future may have under the statutes of the State of New York, relating to mechanics' and materialmens' liens on: (i) the above described premises and improvements thereon; (ii) the Owner, its title company, lender and their employees, officers and agents; and (iii) the surety or sureties of the Owner, for anything whatsoever related to the Project (including, but not limited to, moneys or other considerations due or to become due from the Owner, whether billed or unbilled) through _____, 20____, on account of labor, services, materials, fixtures or apparatus heretofore furnished through such date by the undersigned for the above premises and improvements thereon. The undersigned further covenants and agrees to save and hold harmless the Owner listed above, from any and all liability or expenses on account of any charges or claims for labor and/or materials provided by the undersigned on or for said project on or prior to the date hereof.

In order to induce payment to be made to the undersigned, the undersigned certifies that it has paid all of its subcontractors, suppliers and employees for all items connected with the above-referenced project all amounts owed for the labor and/or materials covered by payments which the undersigned has received for the project prior to the date hereof.

The undersigned agrees that this Conditional Waiver and Release of Lien may be filed and recorded in the recorder's office of the county in which the above described premises are located and that filing and recording of this waiver shall be constructive notice of its contents to all parties and persons whomsoever.

The undersigned has executed this waiver voluntarily and with full knowledge of the undersigned's rights under law.

DATE: _____, 20___

[NAME OF CONTRACTOR]

By:_____

Name:_____

Title:_____

(Location))
) ss.:
(Location))

On _____, 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/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

CONDITIONAL WAIVER AND RELEASE OF LIEN UPON PROGRESS PAYMENT

TO WHOM IT MAY CONCERN:

CONTRACTOR NAME:_____

PROJECT NAME/PREMISES:_____

TYPE OF WORK AND/OR MATERIAL:_____

OWNER NAME:_____

The undersigned does hereby acknowledge, certify and warrant that the following statement of contract account is correct and complete to and including the date hereof, and that all charges and amounts now due to the undersigned and all charges and costs heretofore incurred by or for the undersigned for labor and materials in connection with the above described premises or improvements thereon have been paid in full (less retainage):

Statement of Contract Account

Original Contract Amount	$_____
Approved Change Orders	$_____
Total Revised Contract	$_____
Total Payments to Date (net of retainage /current request not included)	$_____
Total Amount of Retention Withheld:	$_____

Conditional Waiver and Release of Lien

The undersigned, for and in consideration of $_____ for invoice No. ____, effective upon the Owner making payment on the invoice, does hereby conditionally waive and release any right which it now has or in the future may have under the statutes of the State of New York, relating to mechanics' and materialmens' liens on: (i) the above described premises and improvements thereon; (ii) the Owner, its title company, lender and their employees, officers and agents; and (iii) the surety or sureties of the Owner, for anything whatsoever related to the Project (including, but not limited to, moneys or other considerations due or to become due from the Owner, whether billed or unbilled) through _____, 20__, on account of labor, services, materials, fixtures or apparatus heretofore furnished through such date by the undersigned for the above premises and improvements thereon, exclusive of retention and claims properly submitted pursuant to the Contract. The undersigned further covenants and agrees to save and hold harmless the Owner listed above, from any and all liability or expenses on account of any charges or claims for labor and/or materials provided by the undersigned on or for said project on or prior to the date hereof, exclusive of retention and claims properly submitted pursuant to the Contract.

In order to induce payment to be made to the undersigned, the undersigned certifies that it has paid all of its subcontractors, suppliers and employees for all items connected with the above-referenced project all amounts owed for the labor and/or materials covered by payments which the undersigned has received for the project prior to the date hereof.

The undersigned agrees that this Conditional Waiver and Release of Lien may be filed and recorded in the recorder's office of the county in which the above described premises are located and that filing and recording of this waiver shall be constructive notice of its contents to all parties and persons whomsoever.

The undersigned has executed this waiver voluntarily and with full knowledge of the undersigned's rights under law.

DATE:_____, 20___

[NAME OF CONTRACTOR]

By:_____

Name:_____

Title:_____

(Location))
) ss.:
(Location))

On _____, 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/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

UNCONDITIONAL WAIVER AND RELEASE OF LIEN UPON FINAL PAYMENT

TO WHOM IT MAY CONCERN:

CONTRACTOR/ NAME: _____

PROJECT NAME/PREMISES: _____

TYPE OF WORK AND/OR MATERIAL: _____

OWNER NAME: _____

The undersigned does hereby acknowledge, certify and warrant that the following statement of contract account is correct and complete to and including the date hereof, and that all charges and amounts now due to the undersigned and all charges and costs heretofore incurred by or for the undersigned for labor and materials in connection with the above described premises or improvements thereon have been paid in full:

Statement of Contract Account

Original Contract Amount	$_____
Approved Change Orders	$_____
Total Revised Contract	$_____
Total Payments Received	$_____

Unconditional Waiver and Release of Lien

The undersigned hereby acknowledges and certifies: (i) receipt of the amount of Total Payments Received (in cash only and not in equivalents or other agreements) stated above, (ii) that this amount represents payment in full for all amounts due to the undersigned and all charges and costs incurred by or for the undersigned for labor and materials in connection with the above described premises or improvements thereon, as increased or decreased by the Approved Change Orders amount stated above, and (iii) that the amounts stated above are true and correct and there are no additional costs or claims for any extras or additions for labor, material or supplies in connection with the premises.

The undersigned does hereby waive and release any right which it now has or in the future may have under the statutes of the State of New York, relating to mechanics' and materialmens' liens on: (i) the above described premises and improvements thereon; (ii) the Owner, its title company, lender and their employees, officers and agents; and (iii) the surety or sureties of the Owner, for anything whatsoever related to the Project (including, but not limited to, moneys or other considerations due or to become due from the Owner, whether billed or unbilled), on account of labor, services, materials, fixtures or apparatus furnished by the undersigned for the above premises and improvements thereon. The undersigned further covenants and agrees to save and hold harmless the Owner listed above, from any and all liability or expenses on account of any charges or claims for labor and/or materials provided by the undersigned on or for said project.

The undersigned certifies that it has been paid in full and has paid in full all of its subcontractors, suppliers and employees for all items connected with the above-referenced project, including all amounts owed for the labor, materials, services and supplies for the project.

The undersigned agrees that this Unconditional Waiver and Release of Lien may be filed and recorded in the recorder's office of the county in which the above described premises are located and that filing and recording of this waiver shall be constructive notice of its contents to all parties and persons whomsoever.
The undersigned has executed this waiver voluntarily and with full knowledge of the undersigned's rights under law.
DATE: _____, 20___

[NAME OF CONTRACTOR]
By: _____
Name: _____
Title: _____

(Location))
) ss.:
(Location))

On _____, 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/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____

Notary Public

UNCONDITIONAL WAIVER AND RELEASE OF LIEN UPON PROGRESS PAYMENT

TO WHOM IT MAY CONCERN:

CONTRACTOR NAME:_____

PROJECT NAME/PREMISES:_____

TYPE OF WORK AND/OR MATERIAL:_____

OWNER NAME:_____

The undersigned does hereby acknowledge, certify and warrant that the following statement of contract account is correct and complete to and including the date hereof, and that all charges and amounts now due to the undersigned and all charges and costs heretofore incurred by or for the undersigned for labor and materials in connection with the above described premises or improvements thereon have been paid in full (less retainage):

Statement of Contract Account

Original Contract Amount	$_____
Approved Change Orders	$_____
Total Revised Contract	$_____
Total Payments to Date (net of retainage /current request not included)	$_____
Total Amount of Retention Withheld:	$_____

Unconditional Waiver and Release of Lien

The undersigned, for and in consideration of $_____ received for invoice No. ____, does hereby waive and release any right which it now has or in the future may have under the statutes of the State of New York relating to mechanics' and materialmens' liens on: (i) the above described premises and improvements thereon; (ii) the Owner, its title company, lender and their employees, officers and agents; and (iii) the surety or sureties of the Owner, for anything whatsoever related to the Project (including, but not limited to, moneys or other considerations due or to become due from the Owner, whether billed or unbilled) through _____, 20____, on account of labor, services, materials, fixtures or apparatus heretofore furnished through such date by the undersigned for the above premises and improvements thereon, exclusive of retention and claims properly submitted pursuant to the Contract. The undersigned further covenants and agrees to save and hold harmless the Owner listed above, from any and all liability or expenses on account of any charges or claims for labor and/or materials provided by the undersigned on or for said project on or prior to the date hereof, exclusive of retention and claims properly submitted pursuant to the Contract.

In order to induce payment to be made to the undersigned, the undersigned certifies that it has paid all of its subcontractors, suppliers and employees for all items connected with the above-referenced project all amounts owed for the labor and/or materials covered by payments which the undersigned has received for the project prior to the date hereof.

The undersigned agrees that this Unconditional Waiver and Release of Lien may be filed and recorded in the recorder's office of the county in which the above described premises are located and that filing and recording of this waiver shall be constructive notice of its contents to all parties and persons whomsoever.

The undersigned has executed this waiver voluntarily and with full knowledge of the undersigned's rights under law.

DATE: _____, 20___

[NAME OF CONTRACTOR]

By:_____

Name:_____

Title:_____

(Location))
) ss.:
(Location))

On _____, 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/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

CONDITIONAL WAIVER AND RELEASE OF LIEN UPON FINAL PAYMENT

TO WHOM IT MAY CONCERN:

SUBCONTRACTOR NAME:_____

PROJECT NAME/PREMISES:_____

TYPE OF WORK AND/OR MATERIAL:_____

OWNER NAME:_____

The undersigned does hereby acknowledge, certify and warrant that the following statement of contract account is correct and complete to and including the date hereof, and that all charges and amounts now due to the undersigned and all charges and costs heretofore incurred by or for the undersigned for labor and materials in connection with the above described premises or improvements thereon have been paid in full (less retainage):

Conditional Waiver and Release of Lien

The undersigned, for and in consideration of the final payment for invoice No. ____, effective upon the Owner making payment on the invoice, does hereby conditionally waive and release any right which it now has or in the future may have under the statutes of the State of New York, relating to mechanics' and materialmens' liens on: (i) the above described premises and improvements thereon; (ii) the Owner, its title company, lender and their employees, officers and agents; and (iii) the surety or sureties of the Owner, for anything whatsoever related to the Project (including, but not limited to, moneys or other considerations due or to become due from the Owner, whether billed or unbilled) through _____, 20____, on account of labor, services, materials, fixtures or apparatus heretofore furnished through such date by the undersigned for the above premises and improvements thereon. The undersigned further covenants and agrees to save and hold harmless the Owner listed above, from any and all liability or expenses on account of any charges or claims for labor and/or materials provided by the undersigned on or for said project on or prior to the date hereof.

In order to induce payment to be made to the undersigned, the undersigned certifies that it has paid all of its subcontractors, suppliers and employees for all items connected with the above-referenced project all amounts owed for the labor and/or materials covered by payments which the undersigned has received for the project prior to the date hereof.

The undersigned agrees that this Conditional Waiver and Release of Lien may be filed and recorded in the recorder's office of the county in which the above described premises are located and that filing and recording of this waiver shall be constructive notice of its contents to all parties and persons whomsoever.

The undersigned has executed this waiver voluntarily and with full knowledge of the undersigned's rights under law.

DATE: _____, 20___

[NAME OF SUBCONTRACTOR]

By:_____

Name:_____

Title:_____

(Location))
) ss.:
(Location))

On _____, 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/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

CONDITIONAL WAIVER AND RELEASE OF LIEN UPON PROGRESS PAYMENT

TO WHOM IT MAY CONCERN:

SUBCONTRACTOR NAME:_____

PROJECT NAME/PREMISES:_____

TYPE OF WORK AND/OR MATERIAL:_____

OWNER NAME:_____

The undersigned does hereby acknowledge, certify and warrant that the following statement of contract account is correct and complete to and including the date hereof, and that all charges and amounts now due to the undersigned and all charges and costs heretofore incurred by or for the undersigned for labor and materials in connection with the above described premises or improvements thereon have been paid in full (less retainage):

Conditional Waiver and Release of Lien

The undersigned, for and in consideration of payment for invoice No. ____, effective upon the Owner making payment on the invoice, does hereby conditionally waive and release any right which it now has or in the future may have under the statutes of the State of New York, relating to mechanics' and materialmens' liens on: (i) the above described premises and improvements thereon; (ii) the Owner, its title company, lender and their employees, officers and agents; and (iii) the surety or sureties of the Owner, for anything whatsoever related to the Project (including, but not limited to, moneys or other considerations due or to become due from the Owner, whether billed or unbilled) through _____, 20__, on account of labor, services, materials, fixtures or apparatus heretofore furnished through such date by the undersigned for the above premises and improvements thereon, exclusive of retention and claims properly submitted pursuant to the Contract. The undersigned further covenants and agrees to save and hold harmless the Owner listed above, from any and all liability or expenses on account of any charges or claims for labor and/or materials provided by the undersigned on or for said project on or prior to the date hereof, exclusive of retention and claims properly submitted pursuant to the Contract.

In order to induce payment to be made to the undersigned, the undersigned certifies that it has paid all of its subcontractors, suppliers and employees for all items connected with the above-referenced project all amounts owed for the labor and/or materials covered by payments which the undersigned has received for the project prior to the date hereof.

The undersigned agrees that this Conditional Waiver and Release of Lien may be filed and recorded in the recorder's office of the county in which the above described premises are located and that filing and recording of this waiver shall be constructive notice of its contents to all parties and persons whomsoever.

The undersigned has executed this waiver voluntarily and with full knowledge of the undersigned's rights under law.

DATE:_____, 20___

[NAME OF SUBCONTRACTOR]

By:_____

Name:_____

Title:_____

(Location))
) ss.:
(Location))

On _____, 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/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

UNCONDITIONAL WAIVER AND RELEASE OF LIEN UPON FINAL PAYMENT

TO WHOM IT MAY CONCERN:

SUBCONTRACTOR NAME: _____

PROJECT NAME/PREMISES: _____

TYPE OF WORK AND/OR MATERIAL: _____

OWNER NAME: _____

The undersigned does hereby acknowledge, certify and warrant that the following statement of contract account is correct and complete to and including the date hereof, and that all charges and amounts now due to the undersigned and all charges and costs heretofore incurred by or for the undersigned for labor and materials in connection with the above described premises or improvements thereon have been paid in full:

Unconditional Waiver and Release of Lien

The undersigned hereby acknowledges and certifies: (i) receipt of the total amount due to the undersigned in connection with the work, services, materials, and equipment furnished to the above referenced project, (ii) that such amount represents payment in full for all amounts due to the undersigned and all charges and costs incurred by or for the undersigned for labor and materials in connection with the above described premises or improvements thereon, as increased or decreased by the approved change orders amount, and (iii) that the amounts heretofore paid are true and correct and there are no additional costs or claims for any extras or additions for labor, material or supplies in connection with the premises.

The undersigned does hereby waive and release any right which it now has or in the future may have under the statutes of the State of New York, relating to mechanics' and materialmens' liens on: (i) the above described premises and improvements thereon; (ii) the Owner, its title company, lender and their employees, officers and agents; and (iii) the surety or sureties of the Owner, for anything whatsoever related to the Project (including, but not limited to, moneys or other considerations due or to become due from the Owner, whether billed or unbilled), on account of labor, services, materials, fixtures or apparatus furnished by the undersigned for the above premises and improvements thereon. The undersigned further covenants and agrees to save and hold harmless the Owner listed above, from any and all liability or expenses on account of any charges or claims for labor and/or materials provided by the undersigned on or for said project.
The undersigned certifies that it has been paid in full and has paid in full all of its subcontractors, suppliers and employees for all items connected with the above-referenced project, including all amounts owed for the labor, materials, services and supplies for the project.

The undersigned agrees that this Unconditional Waiver and Release of Lien may be filed and recorded in the recorder's office of the county in which the above described premises are located and that filing and recording of this waiver shall be constructive notice of its contents to all parties and persons whomsoever.

The undersigned has executed this waiver voluntarily and with full knowledge of the undersigned's rights under law.
DATE: _____, 20___

[NAME OF SUBCONTRACTOR]
By: _____
Name: _____
Title: _____

(Location))
) ss.:
(Location))

On _____, 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/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____

Notary Public

UNCONDITIONAL WAIVER AND RELEASE OF LIEN UPON PROGRESS PAYMENT

TO WHOM IT MAY CONCERN:

SUBCONTRACTOR NAME:_____

PROJECT NAME/PREMISES:_____

TYPE OF WORK AND/OR MATERIAL:_____

OWNER NAME:_____

The undersigned does hereby acknowledge, certify and warrant that the following statement of contract account is correct and complete to and including the date hereof, and that all charges and amounts now due to the undersigned and all charges and costs heretofore incurred by or for the undersigned for labor and materials in connection with the above described premises or improvements thereon have been paid in full (less retainage):

Unconditional Waiver and Release of Lien

The undersigned, for and in consideration for payment for invoice No. ____, does hereby waive and release any right which it now has or in the future may have under the statutes of the State of New York relating to mechanics' and materialmens' liens on: (i) the above described premises and improvements thereon; (ii) the Owner, its title company, lender and their employees, officers and agents; and (iii) the surety or sureties of the Owner, for anything whatsoever related to the Project (including, but not limited to, moneys or other considerations due or to become due from the Owner, whether billed or unbilled) through _____, 20____, on account of labor, services, materials, fixtures or apparatus heretofore furnished through such date by the undersigned for the above premises and improvements thereon, exclusive of retention and claims properly submitted pursuant to the Contract. The undersigned further covenants and agrees to save and hold harmless the Owner listed above, from any and all liability or expenses on account of any charges or claims for labor and/or materials provided by the undersigned on or for said project on or prior to the date hereof, exclusive of retention and claims properly submitted pursuant to the Contract.

In order to induce payment to be made to the undersigned, the undersigned certifies that it has paid all of its subcontractors, suppliers and employees for all items connected with the above-referenced project all amounts owed for the labor and/or materials covered by payments which the undersigned has received for the project prior to the date hereof.

The undersigned agrees that this Unconditional Waiver and Release of Lien may be filed and recorded in the recorder's office of the county in which the above described premises are located and that filing and recording of this waiver shall be constructive notice of its contents to all parties and persons whomsoever.

The undersigned has executed this waiver voluntarily and with full knowledge of the undersigned's rights under law.

DATE: _____, 20___

[NAME OF SUBCONTRACTOR]

By:_____

Name:_____

Title:_____

(Location))
) ss.:
(Location))

On _____, 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/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

AIA® Document A132® – 2019 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the day of in the year 2025
(In words, indicate day, month, and year.)

for the following **PROJECT**:
(Name and location or address)

Pearl River Public Library Renovation
80 Franklin Avenue
Pearl River, New York 10965

THE OWNER:
(Name, legal status, and address)

Pearl River Public Library
80 Franklin Avenue
Pearl River, New York 10965
(845) 735-4084

THE CONTRACTOR:
(Name, legal status, and address)

TABLE OF ARTICLES

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A232™–2019, General Conditions of the Contract for Construction, as modified by the parties.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A232™–2019, General Conditions of the Contract for Construction. Article 11 of A232™–2019 contains additional insurance provisions

request, provide certificates of insurance evidencing such coverage.

§ A.2.2 Liability Insurance
The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance
§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm.. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to false work and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's, Construction Manager's, and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures
If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[ ] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

[ ] **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

[ ] **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

[ ] **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

[ ] **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

[ ] **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

[ ] **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[ ] **§ A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information.
(Indicate applicable limits of coverage or other conditions in the fill point below.)

[ ] **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

§ A.2.6 Owner's carrying of insurance as set forth in A.2.3 or A.2.4 shall in no way limit the Contractor's liability under the Agreement.

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self- insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the insurance policies required below to include (1) the Owner, the Pearl River School District, the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. The additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, and the Construction Manager and the Construction Manager's consultants, CG 20 32 07 04. For the avoidance of doubt, endorsements specifically naming all additional insureds shall be required (blanket endorsements purporting to grant additional insured status are not sufficient).

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

Three (3) years after the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, as modified by the parties.

§ A.3.2.2 Commercial General Liability[1]

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less

[1] Please confirm coverage amount. Also, coverage amounts should be adjusted based on the scope of the work for a particular contract.

than One Million Dollars ($ 1,000,000) each occurrence, Two Million Dollars ($ 2,000,000) general aggregate, and Two Million Dollars ($ 2,000,000) aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;

.2 personal injury and advertising injury;

.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;

.4 bodily injury or property damage arising out of completed operations; and

.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the Work involves such hazards.

.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

.12 Claims for Action Over / Labor Law Coverage.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than One Million Dollars ($ 1,000,000) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor shall maintain an Umbrella Excess Liability policy with coverage of not less than Ten Million Dollars ($10,000,000). The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than One Million Dollars ($ 1,000,000) each accident, One Million Dollars ($ 1,000,000) each employee, and One Million Dollars ($ 1 ,000,000) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution

Liability insurance, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[ ] **§ A.3.3.2.1** If there is only one Contractor performing the Work on the Project, property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:

(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

[ ] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than ($) per claim and ($) in the aggregate, for Work within fifty (50) feet of railroad property.

[ ] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than ($) per claim and ($) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[ ] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[ ] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the

Contractor and used on the Project, including scaffolding and other equipment.

[ ] **§ A.3.3.2.6 Other Insurance**

(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.4 Performance Bond and Payment Bond

§ A.3.4.1 The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:

(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	100%
Performance Bond	100%

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

§ A.3.4 .2 Maintenance Bond. The Contractor shall maintain a maintenance bond, which shall remain in effect during the term of any warranty or guarantee to be furnished under the Agreement and in no event for a period of not less than two (2) years following the issuance of a certificate of Substantial Completion. The maintenance bond shall be in the amount of one hundred percent (100%) of the Contract Sum and shall cover all the Work under the Agreement.

§ A.3.4.3 Bonding Company. The Contractor shall keep the bonding company informed of any changes of its contract with the Owner. The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

§ A.4.1 The Contractor's insurance policies required hereunder shall be endorsed to provide thirty (30) days' prior written notice to the Owner of cancellation, material charge or non-renewal. If the Contractor's insurer refuses to issue such an endorsement, then the Contractor shall be responsible for providing such notice.

§ A.4.2 The amount of insurance provided in the aforementioned insurance coverages shall not be construed to be a limitation of the liability on the part of the Contractor or any of its Subcontractors.

§ A.4.3 The carrying of insurance described shall in no way be interpreted as relieving the Contractor or any Subcontractor of any responsibility or liability under this Agreement.

§ A.4.4 In the event of a failure of the Contractor to furnish and maintain said insurance and to furnish satisfactory evidence thereof, the Owner shall have the right (but not the obligation) to take out and maintain the same for all parties on behalf of the Contractor who agrees to furnish all necessary information thereof and to pay the cost thereof to the Owner immediately upon presentation of an invoice.

§ A.4.5 Any work performed without first having a Certificate of Insurance approved by Owner is at the Contractor's own risk.

§ A.4.6 Unless otherwise agreed to by the Owner in writing on a case-by-case basis, each Subcontractor shall be required to carry insurance complying with the requirements set forth above.

SECTION 007200
GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.1 The General Conditions applicable to this contract is attached following this page.

RELATED REQUIREMENTS

2.1 SECTION 007300 - Supplementary Conditions.

SUPPLEMENTARY CONDITIONS

3.1 REFER TO DOCUMENT 007300 - Supplementary Conditions FOR AMENDMENTS TO THESE GENERAL CONDITIONS.

END OF SECTION

Document A232® – 2019

General Conditions of the Contract for Construction, *Construction Manager as Adviser Edition*

for the following PROJECT:
(Name, and location or address)

Pearl River Public Library Renovation
80 Franklin Avenue
Pearl River, New York 10965

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

Calgi Construction Company, Inc.
56 Lafayette Avenue, Suite 350
White Plains, New York 10603

THE OWNER:
(Name, legal status, and address)

Pearl River Public Library
80 Franklin Avenue
Pearl River, New York 10965
(845) 735-4084

THE ARCHITECT:
(Name, legal status, and address)

Lothrop Associates Architects D.P.C.
333 Westchester Avenue
White Plains, New York 10604
(914) 741-1115

TABLE OF ARTICLES

ADDITIONS AND DELETIONS:
The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents. The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract. The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

§ 1.1.3 The Work. The term "Work" means the construction and services required by or reasonably inferable from the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 The Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.8 The Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.9 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.10 Initial Decision Maker. The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the

Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents or reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.1.2 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

.1 Change Orders with those of later date having precedence over those of earlier date.
.2 Scope Addenda, with those of later date having precedence over those of earlier date.
.3 The Agreement (including its exhibits unless specifically listed in this Section).
.4 These General Conditions of the Contract for Construction.
.5 Drawings and Specifications.

If there is any inconsistency in the Drawings or between the Drawings and the Specifications or between or within any of the Contract Documents that is not resolved by the order of precedence set forth above, unless otherwise ordered in writing by the Owner, the Contractor shall provide the better quality of or the greater quantity of Work, product, or services for the benefit of the Owner unless the result would be unreasonable, in the judgment of the Architect.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 When reference is made in the Contract Documents to specifications of a manufacturer, trade association, governmental agency, reference standard, or similar source (such as ASTM, AISC, ACI, etc.) such is made part of the Contract Documents, having the force and effect as though reproduced herein, and upon entering into the Contract, Contractor acknowledges its familiarity with those pertaining to its Work.

§ 1.2.5 The approval by the Owner or any of its agents of any action, document or other item of the Contractor or Architect shall not relieve either of their respective obligations under the Contract Documents except as expressly set forth in a Modification.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 Unless otherwise agreed by the Owner and Architect, the Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery (or upon refusal to accept delivery).

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon written protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to written protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work, and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and

the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit[1].

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively; provided, however, that if Owner elects not to employ a successor Architect or Construction Manager, then the Architect's and Construction Manager's responsibilities shall be fulfilled by Owner.

§ 2.3.5 The Owner shall, if requested by the Contractor, furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Owner does not warrant the completeness, correctness, or accuracy of the above-mentioned documents. The Contractor shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.6 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.7 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3.8 The Owner shall forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to

[1] Please confirm that the Library and not any contractor will obtain the building permit.

the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3. The Owner's right to stop the Work shall be in addition to any other rights pursuant to Article 14 hereof.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to review by the Construction Manager and prior approval of the Architect, and the Construction Manager or Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 By executing the Agreement, the Contractor represents that it has examined the job site and the Drawings and Specifications, has satisfied itself as to the conditions under which it will be obliged to operate in performing the Work, including any obstructions, difficulties and restrictions attending the execution of the Work at the site; amount of Work; character and nature of the Work; the equipment and facilities needed preliminary to and during the prosecution of the Work; the accommodation of the Work to and/or by work that may be performed by or for the Owner under other contracts, all required connections of any sort to such work under other contracts, and scheduling of Work as required in coordination with such work under other contracts; and any other consideration which may affect the Work in any manner. Subject to the terms and conditions of this Agreement, the Contractor acknowledges and agrees that it is responsible for completion of the Work for the Contract Sum and within the Contract Time. The Contractor represents and warrants that it has reviewed and fully understands the scope of work set forth in the Drawings and Specifications. Notwithstanding anything to the contrary contained elsewhere in these General Conditions, no increase in the Contract Sum or extension of the Contract Time shall be permitted to the extent such representation is discovered to have been false.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, , as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work in accordance with the Performance Expectations. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner, the Construction Manager, and the Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. Unless the Architect or the Construction Manager objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of the Project already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 The Contractor warrants that it has good title to all product used as part of the Work. No product or other supplies shall be purchased by the Contractor or any of its Subcontractors which are subject to a chattel mortgage, conditional sale, or other agreement by which an interest is retained by the seller.

§ 3.4.5 The Contractor shall ensure that no employee or applicant for employment is discriminated against because of race,

color, religion, sex, gender, national origin, or any other protected characteristic, including (without limitation) in actions relating to: employment, promotion, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation and selection for training, including apprenticeship. The Contractor shall place this same requirement on those under his direction and control on the Project, including Subcontractors.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents and (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist in the general vicinity of the Project and, if the Project involves renovation of an existing building, from those ordinarily found to exist in buildings of the same age and character as the building housing the Project and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially, as described in (1) and (2) above, and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different, as described in (1) and (2) above, and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner, Construction Manager, and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the

operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents:

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner, Construction Manager, or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for the Work, which schedule shall be consistent with the Milestone Schedule attached to the Agreement. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager and Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 3.10.5 The Contractor will schedule and otherwise perform its Work as required so as not to interrupt or disturb the activities of the Owner or other Contractors employed at the site conducted within or about the Owner's buildings and lands adjacent to the site. The following are, without limitation, examples of prohibited interruptions and disturbances: creating noxious or offensive odors; causing blockage of vehicular or pedestrian traffic by the Contractor's personnel, equipment, vehicles, debris or materials; causing loud noises near occupied areas; and causing interruption of utilities or services essential to the Owner's activities.

§ 3.10.6 All expenses for overtime or premium costs for product or shipping necessary for adherence to the Project schedule shall be the responsibility of the Contractor, who shall notify the Owner immediately of any delays that might affect the Project schedule; unless Contractor is entitled to an extension of the Contract Time in accordance with the terms of the Agreement or these General Conditions, in which case Owner shall have the right to elect to pay expenses for overtime or premium costs in lieu of granting an extension of the Contract Time.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Construction Manager, Architect, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data, and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work. All Shop Drawings shall be prepared by persons and entities possessing expertise and experience in the trade for which the Shop Drawing is prepared and, if required by the Contract Documents or by applicable law, by a licensed engineer.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been reviewed and approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, the Architect, and the Construction Manager shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.13.3 Security of all product or tools wherever stored or installed shall be the responsibility of the Contractor, who shall

provide such temporary locks, gang boxes, and other security devices as it may deem necessary for the security of such items and other goods and those of its Subcontractors. All such security arrangements are subject to the advance approval of the Construction Manager. Where exterior storage is authorized, the Contractor shall be solely responsible for suitable protection of the stored materials and equipment.

§ 3.13.4 The Contractor shall furnish, erect and maintain all staging and scaffolding required for the Work. Staging and scaffolding shall be erected and removed by experienced staging builders and shall have the accident prevention devices required by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities.

§ 3.13.5 The Contractor shall furnish and maintain all temporary ladders, ramps, runways, chutes, derricks, stairs, hoists, cranes and similar items required for the proper execution of the Work, including the work of Subcontractors. Any and all of these facilities shall be constructed so as to prevent damage to, including staining or marring of, permanent Work. All damage resulting from the use of such facilities shall be repaired by the Contractor at its sole cost and expense.

§ 3.13.6 Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, damage and all other adversity are solely the responsibility of the Contractor.

§ 3.13.7 Neither Contractor nor any entity for whom the Contractor is responsible shall erect any sign on the Project site without the prior written consent of the Owner.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager, and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner, Architect, or Construction Manager. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, members, partners, officers, directors, representatives, agents and employees of any of them from and against all liabilities, claims, damages, losses, and expenses, including but not limited to reasonable attorneys' fees and court costs, arising out of or resulting from performance of the Work, provided that such liability, claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by or resulting from, in whole or in part, the acts, errors, omissions, or willful misconduct of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder; provided, however, that nothing herein shall require the Contractor to indemnify any indemnitee to the extent the liability, claim, damage, loss or expense is caused by the negligence of the indemnitee and indemnification of such indemnitee is precluded by applicable laws. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

§ 4.1.3 Duties, responsibilities, and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Construction Manager, and Architect. In the event of such restriction, modification, or extension, then Owner shall notify the Contractor.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project Schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with other Contractors shall be through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor

as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.18 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of the Construction Manager, Owner, or Contractor through the Construction Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith.

§ 4.2.20 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Construction Manager, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required and the Contractor has provided documentation substantiating its entitlement to an adjustment in the Contract Sum or the Contract Time.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

§ 5.3.1 By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.2 Any part of the Work performed for the Contractor by a Subcontractor shall be pursuant to a written subcontract between the Contractor and such Subcontractor. Each such subcontract shall contain provisions requiring:

- **.1** maintenance of insurance in accordance with the requirements of the Contract Documents;
- **.2** execution of conditional lien waivers acceptable to Owner as a condition of payment by the Contractor and unconditional lien waivers upon receipt of payment from the Contractor, and
- **.3** compliance with all other relevant provisions of the Contract Documents.

The Subcontractor shall not be a third-party beneficiary of this Agreement. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with its Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Section 5.3, and identify to the Subcontractor any terms and conditions of the proposed Subcontract which

may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Documents available to its Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity. If the Owner assigns the subcontract to a successor Contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor Contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained pursuant to contracts between the Owner and such Separate Contractors.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Separate Contractors, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and the Architect of such discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractors or other Contractors that the Contractor is not expected to discover by using the Performance Expectations.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces, Separate Contractors, or other Contractors.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction, or to property of the Owner, Separate Contractors, or other Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, other Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work. Except as permitted in Section 7.3, any change in the Contract Sum or the Contract Time shall be accomplished only by Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work shall be the basis of any Claim for any change in the Contract Sum or the Contract Time.

§ 7.2 Change Orders

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an

itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Construction Manager and Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager and Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Construction Manager shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7. 3.11 The allowance for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:

§ 7.3.11.1 For the Contractor, and for Work performed by the Contractor's own forces, fifteen percent (15%) of the cost.

§ 7.3.11.2 For the Subcontractor, ten percent (10%) of the amount due to the Subcontractor. This amount is the markup for the Contractor and is in addition to the Subcontractor's overhead and profit.

§ 7.3.11.3 Cost to which overhead and profit are to be applied shall be determined in accordance with Subparagraphs 7.3.3 and 7.3.4.

§ 7.3.11.4 All proposals, except those so minor as to be reasonably deemed de minimis shall be accompanied by a complete itemization of costs, including labor, all materials, and Subcontractors. Each proposal shall be submitted in typewritten form, on letterhead of each respective Subcontractor.

§ 7.3.12 Delays and any approved extensions of time amending either (i) the Contract Time or (ii) the Project schedule shall not be considered a Change in the Work and accordingly shall not entitle the Contractor to any additional compensation.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Construction Manager and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts and the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine, provided, however, that an extension of the Contract Time will only be permitted if (i) the Contractor would not have otherwise been delayed as a result of its own acts or omissions, (ii) the delay could not have reasonably been anticipated by the Contractor, and (iii) the Contractor took all reasonable steps to mitigate the impact of such delay.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 Except as provided in this Section 8.3.3, the Contractor shall not be entitled to any damages for any delay in its Work arising, in whole or in part, from any delay contemplated in Section 8.3.1. Notwithstanding the foregoing, if the Contractor is entitled to an extension of the Contract Time under Section 8.3.1 above, then the Contractor shall also be entitled to an equitable increase in the Contract Sum if any such delay gives rise to additional general conditions costs and the Contractor provides documentation substantiating such additional costs. However, the Contractor waives any claim for lost profits, extended home office overhead, damages, or other increase in the Contract Sum on account of any such delay.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Construction Manager, before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work, and consistent with the Price Breakdown attached to the Agreement. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.2.2 Each Application for Payment shall be prepared by Contractor using a modified version of A.I.A. form G702 and G703, "Application and Recommendation for Payment" or another format acceptable to Owner.

§ 9.3 Applications for Payment

§ 9.3.1 The Contractor shall, in accordance with the timeframes set forth in the Agreement, submit to the Construction Manager an itemized Application for Payment prepared in accordance with the Schedule of Values and in the form required under Section 9.2.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents. Applications for Payment must include adjustments (adds or deducts) to the Contract Sum, resulting from Work performed under approved Change Orders or Construction Change Directives and shall be shown separately on the Application for Payment.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials and equipment

relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within five days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within five days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor or other Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager, and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor, and the Contractor shall within thirty (30) days after the date of receipt of notice of the filing of such notice of lien or actual lien, discharge or remove or bond such lien and until such discharge or removal or bonding, the Owner shall have the right to retain from any amounts payable hereunder an amount equal to the amount of such liens together with the costs and expenses, including reasonable attorneys' fees, of defending any actions brought to enforce the same, or incurred in connection therewith or by reason thereof unless such liens resulted from Owner's wrongful nonpayment of amounts due. Owner may apply any amounts retained hereunder to reimburse it for any and all costs, expenses, losses, damage and damages, liabilities, suits, judgments and awards incurred, suffered or sustained by Owner and chargeable to Contractor under this section. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the (i) Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use, (ii) all remaining Work can reasonably and ordinarily be expected to be completed within thirty (30) days; and (iii) all necessary governmental approvals of the Work including, without limitation, a temporary certificate of occupancy (having terms acceptable to the Owner in its sole discretion) have been received.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to

determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute, a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least thirty (30) days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract

Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, (6) final prints for record drawing use, marked by Contractor with record information as set forth in the Contract Documents, together with other pertinent job records, certificates, and operation and instruction manuals, (7) final conditional lien waivers from all Subcontractors and from Contractor in the form attached to the Agreement, and (8), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take necessary precautions for safety of, and shall provide necessary protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and
- **.4** construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the

Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards. The Contractor shall provide all such barricades and other temporary protection as may be required by authorities having lawful jurisdiction, and as may be prudent as a matter of general safety, around all openings of the buildings and improvements where the Work is to be performed, around all open pits or trenches in the vicinity, if any, around all ladders and other equipment and supplies, from weather damage (due, for example, to frost, rain, and heat) and, to the reasonable satisfaction of the Owner, shall pay promptly for any and all damage to any portion of any building, improvements, or the contents thereof which may become damaged as result of Contractor's failure to so protect.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 The Contractor recognizes that certain laws may impose liability upon the Owner without fault on its part for injuries to Contractor's or Subcontractor's employees. As between the Contractor, the Owner, the Construction Manager, and the Architect, the Contractor agrees that it has the responsibility of providing a safe place to work. To the fullest extent permitted by law, however, the Contractor shall hold harmless, defend and indemnify the Owner, the Construction Manager, and the Architect from any liability for damages arising from the Contractor's failure to provide a safe place to work or to comply with applicable laws.

§ 10.3 Hazardous Materials

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner, Construction Manager and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the

Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all reasonable cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Construction Manager and Construction Manager's consultants, and the Architect and Architect's consultants, shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice directly to the Owner, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not

relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform both the Contractor and the Construction Manager, separately and in writing, prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice directly to the Contractor, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all

rights of action against the Contractor, Architect, and Construction Manager for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner and made payable to the Owner for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall, at its sole cost and expense, correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5. This obligation shall survive both final payment for the Work and termination of the Contract.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after

Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall be extended by corrective Work performed by the Contractor pursuant to this Section 12.2 such that any corrective Work enjoys a one (1) year warranty. The foregoing shall not extend the warranty period for any items that were not subject to correction.

§ 12.2.2.4 The warranty shall include all parts and labor and other replacement costs, both on and off site, together with all necessary transportation and shipping charges. The foregoing one-year warranty by the Contractor shall not reduce the warranty period under any warranty provided by Subcontractors and material suppliers. In the event any product warranty runs to the benefit of the ultimate user of the product in question, the Owner shall reasonably cooperate with the Contractor to provide the Contractor access to such warranty protection for the purposes of satisfying the Contractor's warranty obligations hereunder. However, the Contractor acknowledges that it bears primary responsibility to the Owner for the one-year warranty period and for ensuring that the Work conforms to the requirements of the Contract Documents.

§ 12.2.2.5 If, at the end of Contractor's one-year warranty period, any manufacturer or vendor warranty remains in effect that do not, by their terms, run to the benefit of the ultimate user of the product in question, then the Contractor shall assign such warranty to the Owner. When securing any such warranties, the Contractor shall ensure they are assignable without any charge to the Owner, without additional consent from the applicable manufacturer or vendor, and without limiting the coverage provided by such warranty.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner, Separate Contractors, or other Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall

execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment

and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination. However, such payments to Contractor shall be less any setoffs to which Owner may be entitled.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees, or any other persons performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;

.4 violates a provision of the Contract Documents and such violation is not cured within thirty (30) days after receipt of notice from the Owner; or

5 is adjudged bankrupt, makes a general assignment for the benefit of creditors, has a receiver appointed on account of its insolvency, or is placed in reorganization.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in

part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and the Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision,

subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties, the Construction Manager, and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days of receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect

to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4 and 9.10.5, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may

consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SECTION 007300 - SUPPLEMENTARY CONDITIONS

The following supplements modify AIA Document A232-2017, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition. Where any portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 1 - GENERAL PROVISIONS

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following to Section 1.2.2:

The items listed under the SUMMARY ARTICLE in each section of the specifications are intended as a guide, without limiting the scope of the work.

Add the following new Sections 1.2.4, 1.2.5, and 1.2.6:

1.2.4 Sections of Division 1 – General Requirements apply to the execution of the work of all sections of the specifications.

1.2.5 If in the interpretation of Contract Documents it appears that the Drawings and Specifications are not in agreement, in whole or in part, the document requiring the greater specificity, quantity or superior quality shall prevail, as decided by the Architect.

1.2.6 Addenda shall supersede the document(s) they amend.

ARTICLE 2 - OWNER

2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER

Delete Section 2.3.6 in its entirety and substitute with the following:

2.3.6 The Contractor will be furnished, free of charge, an electronic file in PDF format of the Drawings and Project Manual.

ARTICLE 3 – CONTRACTOR

3.5 WARRANTY

Add the following Sections 3.5.3 and 3.5.4:

3.5.3 The warranty provided in paragraph 3.5 shall be in addition to and not a limitation of any other warranty or remedy required by law or by the Contract Documents.

3.5.4 The Contractor shall deliver to the Owner upon completion of all Work under this Contract, its written guarantee made out to the Owner in form satisfactory to the Owner, guaranteeing (and it does hereby so guarantee), that all the Work performed under the Contract is free from defects in labor, workmanship, and materials. This guarantee shall be made to cover (and does cover) a period of one year from the date of Substantial Completion of all Work under the Contract, or for a longer period where so stipulated in the Contract Documents. The warranty set forth herein shall survive expiration and/or termination of this Contract.

3.6 TAXES

Delete Section 3.6 and substitute the following:

The Owner is exempt from payment of federal, state, and local sales and use taxes, on all material and supplies incorporated into the project. Note, this exemption does not, however, apply to tools, machinery, equipment, or other personal property leased, rented or purchased by any Contractor, or Subcontractor, in connection with the work to be performed and the Contractor and each of his Subcontractors shall be responsible for and pay any and all applicable taxes, including sales, Value-Added Tax and compensating use taxes, on any tools, machinery, equipment or other personal property leased, rented or purchased in furtherance of the work to be performed herein .

3.9 SUPERINTENDENT

Delete Section 3.9.1 and substitute the following:

The Contractor shall employ a competent Superintendent, and as many assistants as necessary, all capable of speaking and writing the English language and who shall be in regular and constant attendance at the project site throughout the duration of the Work. The Superintendent shall represent the Contractor, and communications given to the Superintendent shall be deemed binding and have the same force and effect as if given directly to the Contractor.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.6 Remove the words "or will do so" from item (2) of the sentence.

Add the following Sections 3.12.11 and 3.12.12:

3.12.11 Material, Assembly, or Product Substitutions: The Contractor shall be solely responsible for coordinating all work associated with the incorporation into the Work of any proposed and approved material, assembly, or product substitution. When a substitution requires additional time for review and coordination by the Architect, whether incorporated into the Work or not, the Contractor shall pay to the Owner all expenses incurred by the Architect for the additional review and coordination. The Architect shall be reimbursed for the additional time and expense by the Owner.

3.12.12 Work Performed Out-Of-Sequence: If the Contractor, or any of his subcontractors, performs work out-of-sequence with standard industry practice, and thereby requires additional time for review and coordination by the Architect, compensation for the Architect's additional time and services shall be at the Contractor's expense. Contractor shall pay to the Owner all expenses incurred by the Architect for the additional review and coordination. The Architect shall be reimbursed for the additional time and expense by the Owner.

ARTICLE 7 - CHANGES IN THE WORK

7.3 CONSTRUCTION CHANGE DIRECTIVES

Add the following new Sections 7.3.11and 7.3.12:

7.3.11 The allowance for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:

7.3.11.1 For the Contractor, and for Work performed by the Contractor's own forces, 15 percent of the cost.

7.3.11.2 For the Subcontractor, 10 percent of the amount due the Subcontractor. This amount is the markup for the Contractor and is in addition to the Subcontractor's overhead and profit.

7.3.11.3 Cost to which overhead and profit are to be applied shall be determined in accordance with Subparagraphs 7.3.3 and 7.3.4.

7.3.11.4 All proposals, except those so minor as to be reasonably deemed de minimis shall be accompanied by a complete itemization of costs, including labor, all materials, and Subcontractors. Each proposal shall be submitted in typewritten form, on letterhead of each respective Subcontractor.

7.3.12 Delays and any approved extensions of time amending either (i) the Contract Time or (ii) the Progress Schedule shall not be considered a Change in the Work and accordingly shall not entitle the Contractor to any additional compensation.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT

Delete Section 9.3.1 and substitute the following:

9.3.1 The Owner will make partial payments to the Contractor monthly based on a duly certified estimate of the work performed during the preceding calendar month as prepared by the Contractor and determined by the Architect to be properly due. At least ten business days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment, notarized, subscribed, and acknowledged in conformity with the laws of the State of New York, supported by such data substantiating the Contractor's right to payment as the Owner or the Architect may require, such as copies of requisitions from Subcontractors and material suppliers. In making such partial payment monthly, there shall be retained Five (5) percent of the payment amount due. The form of Application for Payment shall be a notarized AIA Document G-702, application and Certification for Payment, supported by AIA G-703, Continuation Sheet, monthly transcript of payroll records, and lien waivers.

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S INSURANCE AND BONDS

Delete Sections 11.1.1 through 11.1.4 in their entirety and substitute the following: Add new Section 11.1.5.

11.1.1 Contractor shall obtain, at its own cost and expense insurance as specified herein from insurance companies licensed and admitted in the State of New York, carrying a Best's financial rating of 'A-' (A-minus) or better, and shall provide evidence of such insurance in a form satisfactory to the Owner. Insurance coverage is required as follows as a minimum:

A. Workers' Compensation and Employer's Liability Policy: Covering operations in New York State pursuant to General Municipal Law, Section 108. The Contract shall be void and of no effect unless the Contractor shall secure compensation for the benefit of, and keep insured during the life of such Contract, such employees in compliance with the workers' compensation law.

B. Comprehensive General Liability Policy: General Contractor shall provide policy(ies) with limits totaling no less than $5,000,000 Bodily Injury and Property Damage. Total coverage can be achieved through any combination of primary and Umbrella/Excess Liability policies. General Liability Policy shall include coverage for:

1. Products/Completed Operations
2. Independent Contractors
3. Contractual Liability (including a Hold Harmless provision)
4. Broad Form Property damage liability (including completed operations)
5. Personal Injury including hazards i, ii, iii, above.
6. The Town of Orangetown, the Architect, and the Engineers shall be named as "Additionally Insured" parties on the policy and the certificate of insurance shall show this as to the liability coverage on the certificate.

C. Comprehensive Automobile Policy: With limits no less than $1,000,000 Bodily Injury and Property Damage liability including coverage for owned, non-owned, and hired private passenger and commercial vehicle.

D. Umbrella Excess Liability: With limits no less than $5,000,000, no exceptions.

E. Owner's Protective Liability Policy: With limits no less than $1,000,000 shall be taken out and maintained during the life of this contract which will protect the owner from claims for damages for personal injury, liability, accidental or wrongful death, as well as property damage which may arise from operations under this contract whether such operations be performed by the Contractor by any Subcontractor, or by anyone acting directly or indirectly on behalf of the Contractor or any Subcontractor.

F. Property Insurance: The Contractor shall provide insurance covering all supplies and materials while in transit and/ or brought to, stored, and installed onsite.

G. Contractor's Equipment: The Contractor shall provide insurance for all equipment, tools, portable enclosures, and vehicles owned, leased, or used by them and shall provide evidence of insurance coverage by providing the Architect with a Certificate of Insurance evincing same. The Contractor shall hold the Owner harmless for any loss or damage including theft, to all equipment, tools, etc. and associated materials.

H. Builder's Risk Insurance: The Contractor shall provide insurance, with limits no less than $2,000,000 to protect the Owner's property, including the building(s), materials, supplies, and equipment, from fire, lightning, hail, explosion, theft, vandalism, and acts of God.

I. **All insurance policies required except Workers' Compensation shall be endorsed to provide coverage to**: "Pearl River Public Library, and their respective officers, employees, volunteers, and agents, and any consultant for or on the Project and their officers, agents, and employees, including Architect and its' consultants."

J. Certificates: Each Insurance Certificate shall provide thirty (30) days written notice, by registered mail with return receipt requested, prior to cancellation or expiration will be given to the Owner and Architect. Policies that lapse and/or expire during term of work shall be re- certified and received by the Owner no less than thirty (30) days prior to expiration or cancellation.

11.1.2 The Contractor shall furnish to the Owner Certificates of Insurance evidencing coverage in compliance with this section within ten (10) business days of signing the Agreement.

11.1.3 The cost of furnishing the above insurance shall be borne by the Contractor; there will be no direct payment for this work. All costs will be deemed to have been included in the price bid for all scheduled items. The Contractor shall require all Subcontractors to provide this same insurance coverage as outlined herein.

11.1.4 All policies except the Workers' Compensation Policy, shall contain Contractor Indemnification pursuant to Section 13.7

Add new Section 11.1.5.

11.1.5 In accordance with the Bidding and Contract Documents, the Contractor shall, at his sole cost and expense, furnish a Performance Bond and a Payment Bond, acceptable to the Owner, covering faithful performance of this Contract and payment of all obligations that may arise thereunder, in such form as the Owner may prescribe and with such sureties as it may approve. The Performance and Payment Bond shall be in the amount of 100 percent of the Contract Amount. The Performance and Payment Bond shall be submitted to the Owner no later than ten (10) calendar days after Notice of Award or Bid Acceptance.

Maintenance Bond, which shall remain in effect during the term of any warranty or guarantee to be furnished hereunder, and in no event for a period of less than one year following the issuance of a final certificate. The Maintenance Bond shall be in the amount of 10 percent of the Final Contract Price and shall cover all work..

The Contractor shall keep the bonding company informed of any changes of his contract with the Owner. The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.2 Correction of Work

Delete Section 12.2.1 in its entirety and substitute the following:

12.2.1 Defective Work - General

Observation of the Work by the Owner, Architect, and/or Engineer shall not relieve the Contractor of any of his obligations to fulfill the Contract as herein described, and defective work shall be made good, and unsuitable materials may be rejected, notwithstanding that such defective or unsuitable work or materials may previously have been overlooked by the Owner, Architect, and/or Engineer and accepted or approved for payment. If the Work or any part thereof shall be found defective at any time before the final acceptance of the whole of the Work, the Contractor, at his sole expense, shall forthwith make good such defect in a manner satisfactory to the Owner upon the advice of the Architect and Engineer, and if any material for use in the Work, or selected therefore, shall be condemned or rejected by the Architect, Owner, or Engineer as unsuitable or not in conformity with the Contract Documents, the Contractor shall forthwith remove such material from the vicinity of the Work. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, consequential damages, the cost of work of other contractors required for the repair or replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. If the Contractor shall fail to remove or replace any defective or unsuitable materials or Work within a reasonable time after written notice to the Contractor, the Owner may, without prejudice to any other remedy it may have, correct such deficiencies, and the expense thereof shall be borne by the Contractor.

Add Section 12.2.6:

12.2.6 Mistakes of Contractor: The Contractor shall pay to the Owner all expenses, losses and damages caused by or relating to any defect, omission or mistake of the Contractor or of his materialmen, suppliers or subcontractors (of any tier), or their agents, or employees, or caused by or relating to the making good of such defect, ommission or mistake. Costs of correcting such mistakes, including additional testing and inspections, the cost of uncovering and replacement, consequential damages, the cost of work of other contractor required for the repair or replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.2 SUCCESSORS AND ASSIGNS

Add the following new Section 13.2.1.1:

13.2.1.1 No successful bidder to whom a contract or purchase order is let, granted, or awarded shall assign, transfer, or convey, its right, title, or interest herein, including the performance of the contract or purchase order or the right to receive monies due or to become due, or of its power to execute the contract or purchase order without the prior written consent of the Owner. In the event the Contractor, without prior written notice, assigns, transfers or conveys its rights, title, or interest in the contract or purchase order, including the performance of this contract or purchase order, or the right to receive monies due or to become due, or its power to execute such contract or purchase order to any other person or corporation, or upon receipt by the Owner of an attachment against the successful bidder, the Owner shall be relieved and discharged from any and all liability and obligation growing out of such contract or purchase order to such Contractor, and the person or corporation to which such contract or purchase order shall have been assigned, its as-signees, and transferees shall forfeit and lose all monies theretofore assigned under the contract or purchase order. This subsection shall not apply to agreements made by the Contractor with subcontractors who will work in conjunction with the Contractor to complete the work outlined in the Contract Documents.

13.4 TESTS AND INSPECTIONS

*Add the phrase "***or public utility companies***" after the words "public authority" in the first and second sentences of Subparagraph 13.4.1.*

*Add the phrase "***or public utility companies***" after the words "public authority" in the first sentence of Subparagraph 13.4.2.*

13.5 INTEREST

Delete Section 13.5.

Add the following new Sections 13.5, 13.6 and 13.7:

13.5 LABOR REQUIREMENTS

13.5.1 The Contractor and each Subcontractor performing the Work under this Contract shall comply with all applicable labor laws, rules, and regulations, including but not limited to all safety, health, and environmental standards.

13.5.2 State of New York, Department of Labor, Bureau of Public Work, Contract Requirements and Schedules of Prevailing Hourly Wage Rates and Supplements are contract requirements. Current schedules and requirements are included under another Section.

13.5.3 The Contractor shall submit to the Owner monthly transcripts of payroll records in a form accepted by the New York State Department of Labor.

13.6 CONSTRUCTION SAFETY AND HEALTH TRAINING

13.6.1 Pursuant to New York State Labor Law Section 220-h, all public work contracts of $250,000.00 or more requires that every worker employed in the performance of such contract shall be certified as having completed an OSHA 10 safety training course. Accordingly, the Contractor shall ensure that all employees engaged in this project shall have received such training prior to the performing any work on the project and, where necessary, shall provide training in OSHA 10 to those persons lacking the requisite training.

13.6.2 The Contractor and Subcontractors must attach a copy of proof of completeion of the OSHA10 course to the first certified payroll submitted to the Owner and on each succeeding payroll where any new or additional employee is first listed.

13.6.3 The Contractor must attach a copy of proof of completion of the OSHA30 course to the first certified payroll submitted to the Owner, for at least one employee directly involved on the project.

13.7 DEFENSE AND INDEMNIFICATION

The Contractor shall protect, defend, indemnify, and hold the Pearl River Public Library (the Owner), and their respective officers, employees, volunteers, and agents free and harmless from and against any and all losses, penalties, damages, settlements, costs, charges, professional fees, or other expenses or liabilities of every kind and character arising out of or relating to any and all claims, liens, demands, obligations, actions, proceedings or causes of action of every kind and character in connection with or arising directly or indirectly out of this Agreement and/or the performance hereof; with-out limiting the generality of the foregoing, any and all such claims, etc., relating to personal injury, death, damage to property, defects in materials or workmanship, actual or alleged infringement of any patent, trademark, copyright (or application for any thereof), or of any other tangible or intangible personal or property right, or any actual or alleged violation of any applicable statute, law, ordinance, administrative order, rule, regulation, decree of any court, shall be included in the indemnity hereunder. The Contractor further agrees to investigate, handle, respond to, provide defense for, and defend any such claims, etc., at his sole expense and agrees to bear all other costs and expenses related thereto, even if it (claims, etc.) is groundless, false, or fraudulent. In any case where such indemnification would violate any applicablen provision of New York State law or regulation, or any other applicable legal prohibition, the foregoing provisions concerning indemnification shall not be construed to indemnify the Owner for damage arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence of the Owner, its officers, employees, volunteers, or agents. This paragraph shall survive any termination or completion of performance of the Contract.

Contractor- Company Name:

_____

Address: _____

_____

_____

(signature)

_____

(print name)

_____

(title)

_____

(dated)

NOTARY
Subscribed and sworn to before me this
_____ day of _____ 20

THIS STATEMENT SHALL BE SUBMITTED ON CONTRACTOR'S LETTERHEAD WITHIN SEVEN (7) CALENDAR DAYS FOLLOWING NOTICE OF AWARD.

END OF SECTION

SECTION 011000
SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Work covered by the Contract Documents.
2. Type of contract.
3. Work under other contracts.
4. Products ordered in advance.
5. Owner-furnished products.
6. Use of premises.
7. Owner's occupancy requirements.
8. Work restrictions.
9. Specification formats and conventions.

B. Related Sections include the following:
1. Division 1 Section "Summary of Multiple Contracts" for division of responsibilities for the Work.
2. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification:
For NYSED Control # 50-03-08-03-6-005-004 – CHILLER REPLACEMENT
For NYSED Control # 50-03-08-03-6-005-005 – RESTROOM RENOVATION
For NYSED Control # 50-03-08-03-6-005-006 – COMPLETE RENOVATION
For NYSED Control # 50-03-08-03-6-005-007 – WINDOW REPLACEMENT
Project Location: 80 Franklin Avenue, Pearl River, NY 10965

B. Owner: Pearl River Public Library - 80 Franklin Avenue, Pearl River, NY 10965

C. Architect: Lothrop Associates Architects D.P.C. – 333 Westchester Avenue, White Plains, NY 10604

D. Construction Manager: Calgi Construction Company, Incorporated, 56 Lafayette Avenue, Suite 350, White Plains, NY 10603
1. Construction Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner

and each Contractor, according to a separate contract between Owner and Construction Manager.

E. Project Coordinator: The Construction Manager has been appointed by Owner to serve as Project Coordinator.

F. The Work consists of the construction of the Complete Renovation of Pearl River Public Library. The work generally includes the work described in Division 00 through Division 34, the Appendices, and the Drawings.

1.4 TYPE OF CONTRACT

A. Project will be constructed under Multiple Prime Contracts. See Division 1 Section "Summary of Multiple Contracts" for a description of work included under each separate contract. Contracts for this Project include the following:
1. Contract No. 001 – General Construction (GCC) for all above NYSED Control #s
2. Contract No. 002 – Plumbing and Fire Protection Construction (P&FC) for all above NYSED Control #s
3. Contract No. 003 – Mechanical (HVAC) Construction (MC) for all above NYSED Control #s
4. Contract No. 004 – Electrical Construction (EC) for all above NYSED Control #s

1.5 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with other separate Prime Contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under other separate Prime Contracts.

B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
1. Telecommunications Contract: Separate contract will be awarded to provide telephone, data, security, AV, and special fire department communications systems.
2. Furniture and Furnishing: Separate contract will be awarded to provide library furniture and furnishing.

1.6 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Contract Work includes providing support systems to receive Owner's equipment and making plumbing, mechanical, and electrical connections.

1.7 USE OF PREMISES

A. General: Each Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Each Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Coordinate site work with Construction Manager to limit interruptions in access.
    a. Schedule deliveries to minimize use of driveways and entrances.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.8 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:30 a.m. to 8:00 p.m., Monday through Friday, except as otherwise indicated.
    1. Weekend and Holiday Hours: Work shall be generally performed between the hours of 10:00 a.m. to 5:00 p.m., except as otherwise indicated.
    2. Early Morning Hours: Comply with the local noise ordinance for work performed before 10:00 am and after 5:00 pm and on weekends and holidays.
    3. All common use temporary facilities and controls must be available for use by the Contractor, separate contractors, their subcontractors and sub-subcontractors, the Owner, Architect, Construction Manager, their agents, and employees, during On-Site Work Hours.
    4. Contractors shall not track dirt on to the streets. Any construction debris that ends up on the streets beyond limits of disturbance noted in the drawings shall be cleaned up on the same day that it was deposited.

1.9 WORK SEQUENCE

A. Coordinate construction schedules and operations with the construction manager

B. Conduct work to provide the least possible interference with the activities of the Owner's personnel

1.10 CONTRACTOR ACCOUNTIBILITY

A. Each Contractor is responsible for completion of its portion of the Work in a timely fashion to allow use of completed facilities. Costs incurred by Owner resulting from failure of Contractor to meet the obligations of timely completion of the Work as stated, will be the responsibility of the Contractor, and liquidated damages will be assessed to the delinquent Contractor's account as stipulated in the Agreement.

1.11 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 41-Division format and CSI/CSC's "Master Format" numbering system.
    1. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    a. The words “shall,” “shall be,” or “shall comply with,” depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 011250
SUMMARY OF MULTIPLE PRIME CONTRACTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes a summary of each contract, including responsibilities for coordination and temporary facilities and controls.

B. Related Sections include the following:
1. Division 1 Section "Summary" for the Work covered by the Contract Documents, restrictions on use of the premises, Owner-occupancy requirements, and work restrictions.
2. Division 1 Section "Project Coordination" for general coordination requirements.
3. Division 1Section "Temporary Facilities and Controls" for specific requirements for temporary facilities and controls.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weather-tight; exterior walls are insulated and weather-tight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 COORDINATION

A. Project Coordinator shall be responsible for coordination between the General Construction Contract, Plumbing and Fire Protection Contract, Mechanical (HVAC) Contract and Electrical Contract.
1. Construction Manager shall act as Project Coordinator.

1.5 PROJECT COORDINATOR

A. Project Coordinator: Full-time Project Coordinator.
1. Coordination activities of Project Coordinator include, but are not limited to, the following:
a. Provide overall coordination of the Work.
b. Coordinate shared access to workspaces.
c. Coordinate product selections for compatibility.
d. Provide overall coordination of temporary facilities and controls.
e. Coordinate, schedule, and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.

f. Coordinate construction and operations of the Work with work performed by each contract and Owner's construction forces.
g. Coordinate preparation of Coordination Drawings prepared by each contractor to coordinate their work with each other.
h. Coordinate sequencing and scheduling of the Work. Include the following:
   1) Initial Coordination Meeting: At earliest possible date, arrange and conduct a meeting with separate Prime Contractors for sequencing and coordinating the Work; negotiate reasonable adjustments to schedules.
   2) Review the individual schedules provided by the Multiple Prime Contractors and incorporate the activities of the owner and architect. Provide amended schedules to the contractor for General Construction who shall then prepare the overall Master Schedule.
   3) Distribute copies of the Master Schedule to the Architect, Owner, and separate Prime Contractors.
i. Provide photographic documentation.
j. Coordinate quality-assurance and quality-control services specified in Division 1 Section "Quality Requirements."
k. Coordinate sequence of activities to accommodate tests and inspections, and coordinate schedule of tests and inspections.
l. Coordinate cutting and patching.
m. Coordinate protection of the Work.
n. Coordinate completion of interrelated punch list items.
o. Coordinate preparation of Project Record Documents if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
p. Collect Record Specification Sections from other contractors, collate Sections into numeric order, and submit complete set.
q. Coordinate preparation of operation and maintenance manuals if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
r. Coordinate sharing access to workspaces by plumbing, fire suppression systems, mechanical, and electrical contractors.
s. Coordinate installation of plumbing, fire suppression systems, mechanical and electrical work into limited spaces.

1.6 GENERAL REQUIREMENTS OF MULTIPLE PRIME CONTRACTS

A. Extent of Contract: Unless the Agreement contains a more specific description of the Work, names and terminology on Drawings and in Specification Sections determine which contract includes a specific element of Project.
   1. Unless otherwise indicated, the Work described in this Section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the Contract Documents.
   2. Local custom and trade union jurisdictional settlements do not control the scope of the Work of each contract. When a potential jurisdictional dispute or similar interruption of work is first identified or threatened, affected contractors shall negotiate a reasonable settlement to avoid or minimize interruption and delays.
   3. Excavation and Back fill of Trenches for the Work of each contract shall be provided by each contract for its own Work to 5"-0" FT. outside the building footprint. Electrical

Prime Contract to provide all excavation and backfill of their trenches beyond the 5'- 0" FT. line.

4. Cutting and Patching: Provided by each contract for its own Work.
5. Through-penetration firestopping for the Work of each contract shall be provided by each contract for its own Work.
6. Each Prime Contract is required to coordinate openings in any new walls and roof with the General Construction Contract.
7. Within fourteen (14) working days after coordinated construction schedule has been received from Project Coordinator, review and submit any and all comments, amendments to, and/or acceptance of said schedule. Project Coordinator shall reissue an amended schedule as necessary showing construction operations sequenced and coordinated with overall construction.
8. Each Prime Contract is required to provide and submit Project closeout requirements.

B. Substitutions: Each contractor shall cooperate with other contractors involved to coordinate approved substitutions with remainder of the Work.

C. Temporary Facilities and Controls: In addition to specific responsibilities for temporary facilities and controls indicated in this Section and in Division 1 Section "Temporary Facilities and Controls," each contractor is responsible for the following:
1. Installation, operation, maintenance, and removal of each temporary facility is usually considered as its own normal construction activity, and costs and use charges associated with each facility.
2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
3. Its own field office, complete with necessary furniture, utilities, telephone and internet services. Electrical service shall be brought in from temporary panel located
   a. 100 feet within the property line to own field office.
4. Its own storage and fabrication sheds.
5. Temporary enclosures for its own construction activities.
6. Hoisting facilities for its own construction activities.
7. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary or other harmful waste materials.
8. Progress cleaning of its own areas on a daily basis.
9. Temporary fire-protection equipment including fire extinguishers.
10. Secure lockup of its own tools, materials, and equipment.
11. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

D. Temporary Heating, Cooling, and Ventilation: Each Contractor is responsible for temporary heating, cooling and ventilation required for own work. The owner will pay for electric utility-use charges.

E. Use Charges: Comply with the following:
1. Water Service: The Owner shall pay the cost for water service, whether metered or otherwise, for water used by all entities engaged in construction activities at the Project site.
2. Electric Power Service: Owner shall pay the cost for electric power service, whether metered or otherwise, for electricity used by all entities engaged in construction activities at Project site with the following conditions:

a. The Owner shall pay for electric energy for temporary light and power except electric energy requiring more than single phase 400 amp service required for temporary trailers for duration of the project.
b. Any requirement for electric energy shall be provided by separate sources and completely paid for by each Contractor requiring such power until primary service is installed.

1.7 GENERAL CONSTRUCTION CONTRACT

A. Work in the General Construction Contract includes, but is not limited to, the following:
1. Work is outlined on Drawings with the Sheet Identifiers "EX"; “D"; “SP for Site”; “A” and "S" and includes any and all interfacing work shown elsewhere on the remaining Contract Drawings: “M & MP”; “P”; “SP for Fire Sprinkler” and “E”.
2. Preparation of coordination drawings, for use by other trades, in compliance with Division 1 Section "Administration Requirements":
   a. Project Coordinator will allocate applicable portions of coordination drawings to the General Construction Contract, Plumbing and Fire Protection Contract, Mechanical (HVAC) Contract and Electrical Contract for functional and spatial relationships of components of architectural, structural, civil, mechanical and electrical systems.
   b. Indicate required installation sequences if necessary.
   c. General Contractor will be responsible for site coordination drawings, site logistic plan and construction implementation plan.
3. Preparation of overall Master Schedule upon completion of initial coordination meeting convened by the Project Coordinator. Update the Master Schedule monthly through project completion.
4. Site preparation including, but not limited to, clearing, grubbing and earthwork as well as excavation for the building and building utilities 5’-0” outside building perimeter and related earthwork. Except electrical prime contract’s work.
5. Site improvements including, but not limited to, roadways, drainage structures, parking lots, pedestrian paving, lawn areas, landscaping, site development furnishings and equipment
6. Water Utilities: Domestic Water Service and Fire Water Service to 5’-0” outside the “HOTBOX” concrete pad.
7. Concrete Utility Pads Slab-on-Grade for Generator, Transformer and “HOTBOX” including required Bollards
8. All Retaining Walls,
9. All Slabs-on-grade and Stairs-on-grade outside of building footprint, including earthwork and insulation.
10. Site layout includes verifying layout information shown on Drawings, in relation to the property survey and existing benchmarks. Locate and layout reference points as indicated on Site drawings in Contract Documents.
11. Construction Layout includes verifying layout information shown on Drawings, in relation to property survey and existing benchmarks. Locate and layout reference points and control lines and levels for structures, building foundations, column grids, and floor levels, including control lines and levels required for fire suppression, plumbing, mechanical and electrical work from a starting point designated as per the Contract Drawings.
12. Foundations include footings and foundation walls.

13. Contractor must employ a licensed surveyor to perform building layout and to provide certification of location of completed foundation anchors. Provide via the required Submittals process a certified anchor bolt survey upon completion of all foundation work and prior to the start of steel erection. Upon completion of all sub/slab plumbing line installations, perform an as-built survey and provide a certified drawing locating all sub-slab lines including their relationships to all interior and exterior walls.
14. Interior Slab-on-grade, including earthwork and insulation.
15. Rain Screen Panels, CMU and required Back-up on all exterior / interior walls, columns, etc. with all necessary reinforcing, ties, etc.
16. Below-Grade building construction, including excavation, backfill and thermal and moisture protection.
17. Superstructure, including floors and roof construction.
18. Exterior enclosure, including walls, parapets, doors, windows and louvers.
19. Roofing, including coverings, flashings, penetration booths and roof specialties
20. Interior construction, including partitions, doors, interior glazed openings and fittings. Interior finishes including supports and hangars installed by other trades.
21. Fire-protection specialties
22. Stairs, including railings and finishes
23. Interior finishes, finish carpentry, architectural woodwork and built –in casework. Interior and Exterior Impact protection and bollards.
24. Conveying systems, including elevator(s)
25. Equipment noted as supplied by General Contractor as well as equipment noted to be supplied by Owner and installed by Genera Contractor.
26. Furnishings, including casework and floor mats.
27. Final property survey.
28. Final cleaning as specified in Section "Execution and Closeout Procedures."
29. Miscellaneous specialties including, but not limited to the following:
    a. Visual display surfaces and casework
    b. Blocking for roof curbs, plumbing fixtures, etc. as required.
    c. Toilet and bath accessories
    d. Toilet Compartments
    e. Lockers
    f. Installation of necessary / required access doors provided by other Prime Contractors
30. Kitchen Cabinets, Stove, Refrigerator, Washer, Dryer etc.

B. Temporary facilities and controls in the General Construction Contract include, but are not limited to, the following:
1. Temporary facilities and controls that are not otherwise specifically assigned to the Plumbing and Fire Protection Contract, Mechanical (HVAC) Contract, and Electrical Contract.
2. Construction Manager’s field office and supplies, including weekly janitorial services.
3. Trenching for all utilities, except for electrical prime contract, by General Contractor up to 5’-0” outside of building perimeter.
4. Stormwater control.
5. Temporary roads and paved areas.
6. Site storm control and drainage.
7. Site sanitary sewage
8. Un-piped temporary toilet fixtures and wash facilities, including disposable supplies.

a. Provide minimum of three temporary toilet fixtures, inclusive of one located at the field offices, for common use and two located within the construction site area where necessary for common use for the entire Contract time. Provide additional as necessary. Maintain and clean temporary toilets as required.

9. Dewatering facilities and drains, unless required solely for the Work of another contract.
10. Excavation support and protection, unless required solely for the Work of another contract.
11. Remove snow and ice from construction areas as required to minimize accumulations. Maintain safe, uninterrupted access to all construction areas.
12. Project identification and temporary signs.
13. Barricades, warning signs, and lights.
14. Site /Building enclosure fence and lockup as necessary.
15. Security enclosures and lockup.
16. Site / Building Environmental protection.
17. Temporary enclosure for building exterior, except as indicated.
18. Until permanent stairs are available, provide temporary stairs where ladders are not adequate, including to the roofs.
19. Pest control. Provide pest control inspection at project closeout as indicated in Division 1 Section “Execution and Closeout Requirements."
20. General waste disposal facilities.
21. Temporary fire-protection equipment.
22. Environmental protection.
23. Temporary water freeze protection structure.

1.8 PLUMBING AND FIRE PROTECTION CONTRACT

A. Work in the Plumbing and Fire Protection Contract includes, but is not limited to, the following:

1. Work is outlined on Drawings with the Sheet Identifier "P" and “SP for Fire Sprinkler”, and includes any and all interfacing work shown elsewhere on the remaining Contract Drawings: "EX"; “D"; “SP for Site”; “A”; "S" “M & MP”; and “E”.
2. Preparation of coordination drawings, for use by other trades, in compliance with Division 1 Section "Project Management and Coordination."
   a. Project Coordinator will allocate applicable portions of coordination drawings to the General Construction Contract, Plumbing and Fire Protection Contract, Mechanical (HVAC) Contract and Electrical Contract for functional and spatial relationships of components of architectural, structural, civil, mechanical and electrical systems.
   b. Indicate required installation sequences if necessary.
3. Gas distribution.
4. Plumbing fixtures, including RPZ and DCDA
5. Domestic water and fire protection water services and distribution.
6. Sanitary waste to 5'-0" FT. outside building perimeter.
7. Stormwater drainage to 5'-0" FT. outside building perimeter.
8. Plumbing connections to equipment furnished by the General Construction Contract, Mechanical (HVAC) Contract and Electrical Contract.
9. Fire protection work: wet-pipe, sprinklers, valves, piping, and risers.
10. Fire protection work: Check valve assemblies and connections to water service.

11. Plumbing and Fire Protection Contract connections to proposed systems and temporary facilities and controls furnished by the General Construction Contract, Mechanical (HVAC) Contract and Electrical Contract.

B. Temporary facilities and controls in the Plumbing Contract include, but are not limited to, the following:
1. Piped water service from point of connection to proposed facility, including, but not limited to, temporary standpipes and hoses for fire protection, and hose-bib, backflow-prevention devices.

1.9 MECHANICAL (HVAC) CONTRACT

A. Work in the Mechanical (HVAC) Contract includes, but is not limited to, the following:
1. Work is outlined on Drawings with the Sheet Identifier "M & MP," and includes any and all interfacing work shown elsewhere on the remaining Contract Drawings: "EX"; “D"; “SP for Site”; “A”; "S"; "P" and “SP for Fire Sprinkler; and “E”.
2. Preparation of coordination drawings, for use by other trades, in compliance with Division 1 Section "Project Management and Coordination."
   a. Project Coordinator will allocate applicable portions of coordination drawings to the General Construction Contract, Plumbing and Fire Protection Contract, Mechanical (HVAC) Contract and Electrical Contract for functional and spatial relationships of components of architectural, structural, civil, mechanical and electrical systems.
   b. Indicate elevations of HVAC systems (including piping and ductwork) with reference to finish floor elevations.
   c. Indicate required installation sequences if necessary.
3. HVAC systems and equipment including rooftop equipment curbs and related vibration control curbs.
4. HVAC instrumentation and controls.
5. HVAC testing, adjusting, and balancing.
6. Building automation system.
7. Mechanical (HVAC) connections to equipment furnished by the General Construction Contract, Plumbing and Fire Protection Contract and Electrical Contract.

1.10 ELECTRICAL CONTRACT

A. Work in the Electrical Contract includes, but is not limited to, the following:
1. Work is outlined on Drawings with the Sheet Identifiers "E" and includes any and all interfacing work shown elsewhere on the remaining Contract Drawings: "EX"; “D"; “SP for Site”; “A”; "S"; "P" and “SP” for Fire Sprinkler; and “M” & “MP”.
2. Preparation of coordination drawings, for use by other trades, in compliance with Division 1 Section “Administration Requirements"
   a. Project Coordinator will allocate applicable portions of coordination drawings to the General Construction Contract, Plumbing and Fire Protection Contract, Mechanical (HVAC) Contract and Electrical Contract for functional and spatial relationships of components of architectural, structural, civil, mechanical and electrical systems.
   b. Indicate required installation sequences if necessary.
3. Site electrical distribution.
4. Site lighting.

5. Electrical service and distribution.
6. Exterior and interior lighting fixtures.
7. Special electrical systems, including the following:
    a. Uninterruptible power supply systems.
    b. Packaged engine generator systems.
    c. Battery power systems.
    d. Lightning protection systems
    e. Cathodic protection.
    f. Fire alarm system.
    g. Grounding
8. Electrical connections to equipment furnished by the General Construction Contract, Plumbing and Fire Protection Contract, Mechanical (HVAC) Contract.
9. Underground utility duct bank, electric, communications, etc. and associated pull boxes, underground utility manholes, conductors and transformer etc.
10. Electrical connections to proposed systems and temporary facilities and controls furnished by the General Construction Contract, Plumbing and Fire Protection Contract and Mechanical (HVAC) Contract.

B. Temporary facilities and controls in the Electrical Contract include, but are not limited to, the following:
1. Temporary electric power service of single phase 400 amp to a distribution panel within Construction Site area as well as area of Field Office(s), not more than 100 ft. in from property line.
2. Electric power service and electric distribution.
3. Lighting, including site lighting.
4. Provide temporary telephone service, electronic communication service, including internet service, and electric power for the Construction Manager field office.

END OF SECTION

SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

1.2 RELATED REQUIREMENTS

A. Section 005000 - Contracting Forms and Supplements: Forms to be used.

1.3 SCHEDULE OF VALUES

A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

B. Forms filled out by hand will not be accepted.

C. Submit Schedule of Values in electronic format (PDF) within 15 days after date of Owner-Contractor Agreement.

D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization and bonds and insurance.

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Execute certification by signature of authorized officer.

E. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed.

F. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

G. Submit one electronic and three hard-copies of each Application for Payment.

H. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.5 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 7 business days.

D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

E. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

F. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

G. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

1.6 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 017000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

1. **Add Alternate: Conference Rooms Shown on Sheet A 161**

NARRATIVE
Addition of five (5) small Conference Rooms.

General Construction (GCC) Contract No. 001
Reference A161 and all related drawings and specifications. Construct conference rooms as depicted. Stud partitions between rooms, outer partition(s) and doors to be Aluminum framed glass.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 -
NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003
Reference M2.2 and all related drawings and specifications for detailed information on the required HVAC and other mechanical components required for this Alternate.

Electrical Construction (EC) Contract No. 004
Reference E2.0, E3.0, E4.0, and all related drawings and specifications for detailed information on the required electrical outlets, lighting fixtures and other wiring/cable required for this Alternate.

2 a. Add Alternate: Electric Service Conduit and Wiring

NARRATIVE
New, below grade/embedded conduit and new electrical service wiring.

General Construction (GCC) Contract No. 001
Reference A020, E7.0, S-501.00 and all related drawings and specifications. Excavate trenches at existing interior concrete slab for installation of new conduit and wiring. Excavate exterior concrete slab and asphalt at the parking lot with trench for installation of new conduit and wiring. Coordinate with EC installation for backfill, compact and cover/patch trenched areas with new level concrete slab, per details provided – prior to backfill, allow PE to inspect.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002 - NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003
NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004

Reference A020, E7.0, S-501.00 and all related drawings and specifications. Refer to the electrical drawings and specifications for detailed information on conduit and wiring replacement.Install new conduit and new wiring from transformer to service panels at the Mechanical Room.

2 b. Add Alternate: Electric Service Wiring

NARRATIVE
New electrical service wiring within existing below grade/embedded conduit.

General Construction (GCC) Contract No. 001 - NO ADDITIONAL WORK

Plumbing and Fire Protection Construction (P&FC) Contract No. 002
NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003
NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
Refer to the electrical scope and all related drawings and specifications for the detailed information on wiring replacement required for this Alternate.

3. Deduct Alternate: Unfinished Second Floor with Equipment Room, Closet, and Secure Storage Room

NARRATIVE
Open stair, landings, Elevator, Plumbing, Walls and Doors of expanded Second Floor Area omitted.

General Construction (GCC) Contract No. 001
Expanded Second Floor to be partially unfinished. Equipment Room including Secure Storage Room partitions, openings, and equipment required therein will be completed as per the original plans. Other rooms and restrooms
will not be built at the expanded Second Floor. At the perimeter of the expanded Second Floor area, install a full height wall as shown on base plans, finished with painted gypsum on either side.
NOTE: Guard rails at the expanded Second Floor are omitted with this Alternate.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002

Reference P-0.1, P-2.1, P-2.2, P-5.1, SP-2.1, SP-2 and all related drawings and specifications. All plumbing work within Toilet Rooms 204 and 205 shall be excluded from the scope. This includes the routing of domestic cold and hot water, sanitary, and vent pipes to the toilets, lavatories, and floor drains. Additionally, elevator sump pump ESP-1 and associate pump discharge piping shall be excluded from the scope. The sprinklers of the unfinished Second Floor shall be exposed upright types instead of concealed pendants. Upright sprinklers in unfinished areas shall be laid out in a grid pattern, adhering to NFPA-13 requirements for Ordinary Hazard Occupancy, with a density of 0.15 GPM/sq. ft. and a maximum coverage of 130 sq. ft. per sprinkler head.

Mechanical (HVAC) Construction (MC) Contract No. 003
Reference M-2.3, M-2.6 and M-5.4 and all related drawings and specifications.Deduct three variable air volume boxes (VAV-2-11, VAV-2-12, VAV-2-13), and associated space temperature sensors, supply air ductwork, and hot water piping. Remove radiant heating panels serving the second floor and cap associated ¾” hot water piping with isolation valves for future use. Remove all exhaust ductwork associated with second-floor restrooms that are no longer in the scope. Retain VAV-2-10 with hot water reheat coil to serve the 214 Unoccupied Space and modify supply ductwork as BID FORM - GCC 00 41 00.01 - 5 shown on drawing M2.6. Add three (3) hot water unit heaters with unit mounted thermostats and associated 1” hot water piping for heating of unoccupied space. Add one (1) 72x16” wall mounted return register as shown on drawings M2.3 and M2.6 for modified return air path to air-handling units (AHUs).

Electrical Construction (EC) Contract No. 004
Reference E-2.0, E-2.2, E-3.0, E-3.1, E-4.0, E-4.1, E-5.0, E-6.0 and E-7.1 and all related drawings and specifications. Deduct power, lighting and fire alarm from the second-floor spaces and elevator. The equipment room will be constructed. Add lighting, convenience receptacles and fire alarm for unfinished space.

4. Deduct Alternate: Install Elevator Shaft but Not the Elevator

NARRATIVE
Elevator Cab & Equipment omitted.General Construction (GCC) Contract No. 001
Construct the elevator shaft, including the structural elements, walls, and access points. Infill Access point openings with a stud partition aligned with the outside face of the shaft and finish with gypsum wall board to be painted.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002
NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003

NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
NO ADDITIONAL WORK

5. Deduct Alternate: Omit Community Room, North Wall (Front Façade) Alterations

NARRATIVE
The Community Room North wall is to remain as existing.

General Construction (GCC) Contract No. 001
Eliminate Community Room North wall alterations including structural steel, rain screen panels and new windows. Existing exterior wall assembly of the Community Room North Wall will remain with this Alternate. Install Interior furring as noted on plans unless Deduct 5 is selected. Window Replacement Project: SED#50-03-08-03-6-005-007 is not omitted with this Alternate.

Plumbing and Fire Protection Construction (P&FC) Contract 002
NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract 003
NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
NO ADDITIONAL WORK

6. Deduct Alternate: Omit Community Room Motorized Partition and Supporting Structure

NARRATIVE
Motorized Bi-fold partition in Community Room to be Omitted

General Construction (GCC) Contract No. 001
Reference A620, Details 1/A620, 3/A620, 8/A620 and 19/A620 to be omitted. This omits the construction of the partition storage closet and supporting steel structure in the Community Room. Dropped Gypsum Board soffit intended to conceal steel beam and partition track to be framed level with the acoustical tile ceiling system.

Plumbing and Fire Protection Construction (P&FC) Contract No. 002
NO ADDITIONAL WORK

Mechanical (HVAC) Construction (MC) Contract No. 003

NO ADDITIONAL WORK

Electrical Construction (EC) Contract No. 004
Reference E3.0 and all related drawings and specifications for the omission of the (2) two key operated, tamper proof, constant pressure control stations and section divider controller for the motorized partition. Omit any related requirements for motor installation.

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.2 RELATED REQUIREMENTS

A. Section 012100 - Allowances, for cash allowances affecting this section.

B. Section 012300 - Alternates, for product alternatives affecting this section.

C. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.3 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, and assemblies.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

1.4 REFERENCE STANDARDS

A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.

B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, and materials constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
2. Agrees to provide the same warranty for the substitution as for the specified product.
3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Assumes responsibilites for determining costs of all other contracts and trades for any proposed substitution.
6. Assumes costs associated with the failure to notify and coordiante a substitution cost with the other contracts. In such cases, the owner shall deduct such costs from the contract.
7. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.

D. Limit each request to a single proposed substitution item.

3.2 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:

B. Submittal Form (before award of contract):
   1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are not permitted.

3.3 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):
   1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request (After Bidding/Negotiating). See this form for additional information and instructions. Use only this form; other forms of submission are not permitted.

B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.

2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
3. Bear the costs caused by proposed substitution of:
    a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

D. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.

3.4 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.
1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.5 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.6 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preconstruction meeting.

B. Site mobilization meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Progress photographs.

F. Coordination drawings.

G. Professional photographs.

H. Submittals for review, information, and project closeout.

I. Number of copies of submittals.

J. Requests for Interpretation (RFI) procedures.

K. Submittal procedures.

1.2 RELATED REQUIREMENTS

A. Section 016000 - Product Requirements: General product requirements.

B. Section 017800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

C. Section 017900 - Demonstration and Training: Submission of video recordings of demonstration of equipment and training of Owner's personnel.

D. Section 019113 - General Commissioning Requirements: Additional procedures for submittals relating to commissioning.
   1. Where submittals are indicated for review by both Architect and the Commissioning Authority, submit one extra and route to Architect first, for forwarding to the Commissioning Authority.
   2. Where submittals are not indicated to be reviewed by Architect, submit directly to the Commissioning Authority; otherwise, the procedures specified in this section apply to commissioning submittals.

1.3 PROJECT COORDINATOR

A. Project Coordinator: Construction Manager.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 011000 - Summary.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect through the Project Coordinator:
1. Requests for Interpretation.
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.
7. Applications for payment and change order requests.
8. Progress schedules.
9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRECONSTRUCTION MEETING

A. Project Coordinator will schedule a meeting after Notice of Award.

B. Attendance Required:
1. Owner.
2. Architect.
3. Contractor.

C. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract, _____ and Architect.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.

7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.2 SITE MOBILIZATION MEETING

A. Project Coordinator will schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

C. Agenda:
1. Use of premises by Owner and Contractor.
2. Owner's requirements.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.3 PROGRESS MEETINGS

A. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

B. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

C. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.

5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to work.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 CONSTRUCTION PROGRESS SCHEDULE

A. Each Contractor shall prepare a CPM schedule, of their Work and provide this information to the General Contractor for coordination into an overall and complete schedule.

B. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

C. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

D. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.

E. Within 10 days after joint review, submit complete schedule.

F. Submit updated schedule with each Application for Payment.

3.5 PROGRESS AND FINAL PROJECT PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

D. In addition to periodic, recurring views, take photographs of each of the following events:
1. Foundations in progress and upon completion.
2. Structural framing in progress and upon completion.
3. Enclosure of building, upon completion.
4. Final completion, minimum of ten (10) photos.

E. Views:
1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
2. Consult with Architect for instructions on views required.
3. Provide factual presentation.

4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
5. Point of View Sketch: Provide sketch identifying point of view of each photograph.

F. Final Completion Photographs: Provide at least 10 photographs of the final compelted project by an experienced professional photographer, acceptable to Architect. The photos shall be made available to the Owner, Architect, Contractors and other involved parties free of licencing fees or other charges.

G. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: Via email.
2. File Naming: Include project identification, date and time of view, and view identification.
3. Point of View Sketch: Include digital copy of point of view sketch with each electronic submittal; include point of view identification in each photo file name.
4. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
5. Hard Copy: Printed hardcopy (grayscale) of PDF file.

3.6 COORDINATION DRAWINGS

A. Provide information required by the Project Coordinator for preparation of coordination drawings.

B. Prepare coordination drawings where for coordination among the contracts and trades to facilitate integration of products and materials fabricated or installed by more than one entity and for coordination.

C. Coordination Drawings may be completed on a phased basis so as not to delay the overall project schedule. Manage the process so that each trade or contractor provides all required information in a timely manner. The CPM Schedule shall include the submission of Coordination Drawings and demonstrate how the Contractors intend to integrate the submission of Coordination Drawings to suit the overall project schedule.

D. Coordination Drawings are intended for use by the respective trades during construction and shall not be construed as replacing either the shop drawings specified in the technical specifications, or the Record Drawings. Coordination Drawings are a tool of communication between trades. Submission to the architect is for information only and the Architect may or may not review the Coordination Drawings.

E. Design Professional review of coordination drawings is to confirm that coordination is being performed among the contracts, but not for the details of the coordination, which are the Contractor's responsibility. If the Design Professional determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Design Professional will so inform the Contractor, who shall make changes as directed and resubmit. Regardless of the Design Professional commentary, coordination shall remain the respnsibility of the contractors.

F. Coordination Drawings shall coordinate the placement and location of ductwork, fittings, light fixtures, cable trays, fire alarm devices, sprinklers, air terminals, hangers, supports and other ceiling mounted items shown and specified with each other, and other building elements such as

ceilings, structural work, case work, equipment, doors, manufacturer's recommended maintenance clearances, code required clearances and visibility sightlines, access doors and other contract work.

G. The Drawings shall coordinate the placement and location of ductwork, fittings, light fixtures, cable trays, fire alarm devices, sprinklers, air terminals, hangers, supports and other ceiling mounted items shown and specified with each other, and other building elements such as ceilings, structural work, case work, equipment, doors, manufacturer's recommended maintenance clearances, code required clearances and visibility sightlines, access doors and other contract work.Identify and resolve all conflicts within, between, and amongst each Contract during the development of coordination drawings.

H. Conflicts identified during the course of construction, and resulting in additional costs to Owner to resolve, will not be permitted. Work required to be modified as a result of poor coordination shall be corrected or reworked at the Contractors' expense and shall not impact the schedule.

I. Ensure that review and coordination between the various project packages has been performed and related work is identified, coordinated, and any conflicts identified have been resolved.

J. Submit Coordination Drawings for review in the same manner as specified for shop drawings. Review of Coordination Drawings shall not relieve the Contractor from his responsibilities for coordinating the work with the work of all trades involved on the Project.

K. Review drawings for accuracy and completeness prior to submission to Architect.

3.7 PROFESSIONAL PHOTOGRAPHS

A. Submit professional quality photographs upon Substantial Completion, as directed by Architect.

B. Photography Type: Digital; electronic files and photographer quality prints.

C. Views:
1. Consult with Architect for instructions on views required.
2. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

D. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: On Photo CD, thumb drive, or downloadable from secure internet location.
2. File Naming: Include project identification, date and time of view, and view identification.
3. Point of View Sketch: Include digital copy of point of view sketch; include point of view identification in each photo file name.
4. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

E. Photographer Quality Prints: Full color; three prints of each view.
1. Glossy; smooth texture; white tint; single weight; high contrast.
2. Size: 8 by 10 inch; mounted for binder and tabs.

3. Identify each print on back. Identify name of Project, contract number, phase, orientation of view, date and time of view, name and address of photographer, and photographer's numbered identification of exposure.
4. Assemble prints into transparent holder sheets for 3-ring binder.
5. Binders: Provide one 2-inch binder with initial submittal.
6. Point of View Sketch: Include printed copy of point of view sketch; include point of view identification on each print.

3.8 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
2. Prepare in a format and with content acceptable to Owner.
3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
a. Approval of submittals (use procedures specified elsewhere in this section).
b. Approval of substitutions (see Section - 016000 - Product Requirements)
c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response.

D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.

2. Owner's, Architect's, and Contractor's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date, and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.

G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.9 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
1. Coordinate with Contractor's construction schedule and schedule of values.
2. Format schedule to allow tracking of status of submittals throughout duration of construction.

3. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
    a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.10 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Where equipment, materials, products, devices, etc. require selection of color and/or finish, selection shall be made by Architect from the manufacturer's full range.

D. Samples will be reviewed for aesthetic, color, or finish selection.

E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.

5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

A. General Requirements:
1. Use a single transmittal for related items.
2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
3. Transmit using approved form.
   a. Use Contractor's form, subject to prior approval by Architect.
4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
   a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
7. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
   a. Deliver submittals to Construction Manager at business address.
8. Schedule submittals to expedite the Project, and coordinate submission of related items.
   a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
   b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
   c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
9. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
10. Provide space for Contractor and Architect review stamps.
11. When revised for resubmission, identify all changes made since previous submission.
12. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.

13. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
14. Submittals not requested will not be recognized or processed.

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Submit concurrently with related shop drawing submittal.
4. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.15 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
a. "No Exceptions Taken", or language with same legal meaning.
b. "Make Corrections Noted", or language with same legal meaning.
1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
2. Not Authorizing fabrication, delivery, and installation:
a. "Amend and Resubmit".
1) Resubmit revised item, with review notations acknowledged and incorporated.
2) Non-responsive resubmittals may be rejected.
b. "Rejected - See Remarks".
1) Submit item complying with requirements of Contract Documents.

E. Architect's actions on items submitted for information:
1. Items for which no action was taken:

a. "Received" - to notify the Contractor that the submittal has been received for record only.

2. Items for which action was taken:
   a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. Testing and inspection agencies and services.

D. Contractor's construction-related professional design services.

E. Contractor's design-related professional design services.

F. Control of installation.

G. Manufacturers' field services.

H. Defect Assessment.

1.2 RELATED REQUIREMENTS

A. Section 012100 - Allowances: Allowance for payment of testing services.

1.3 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2024.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2023.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2023.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2023.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2021.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

H. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

1.4 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
   1. Temporary sheeting, shoring, or supports.
   2. Temporary scaffolding.
   3. Temporary bracing.
   4. Temporary stairs or steps required for construction access only.
   5. Temporary hoist(s) and rigging.
   6. Investigation of soil conditions and design of temporary foundations to support construction equipment.

1.5 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
   1. Structural Design of Formwork: As described in Section 031000 - Concrete Forming and Accessories.
   2. Concrete Mix Design: As described in Section 033000 - Cast-in-Place Concrete. No specific designer qualifications are required.
   3. Structural Design of Metal Framing: As described in Section 054000 - Cold-Formed Metal Framing.
   4. Structural Design of Metal Fabrications: As described in Section 055000 - Metal Fabrications.
   5. Structural Design of Stairs: As described in Section 055100 - Metal Stairs.
   6. Structural Design of Railings: As described in Section 055213 - Pipe and Tube Railings.
   7. Structural Design: As described in Section 074233 - Phenolic Wall Panels.
   8. Structural Design: Include calculations for resisting wind loads, physical characteristics, resulting dimensional limitations as described in Section 086300 - Metal-Framed Skylights.
   9. Design of Structural Components: As described in Section 142100 - Electric Traction Elevators.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
   1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
      a. Full name.
      b. Professional licensure information.

c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
2. Include required product data and shop drawings.
3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
1. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.7 Quality Assurance

A. Testing Agency Qualifications:
1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.8 Testing and Inspection Agencies and Services

A. Owner will employ services of an independent testing agency to perform certain specified testing and inspection; payment for cost of services will be derived from allowance specified in Section 012100; see Section 012100 and applicable sections for description of services included in allowance.

B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing and inspection.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Contractor Employed Agency:
1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
4. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
    a. To provide access to Work to be tested/inspected.
    b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    c. To facilitate tests/inspections.
    d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.3 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of

surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.4 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:
1. Division 1 Section “Summary” for limitations on utility interruptions and other work restrictions.
2. Division 1 Section “Summary of Multiple Prime Contracts” for division of responsibilities for temporary facilities and controls.
3. Division 1 Section “Submittal Procedures” for procedures for submitting copies of implementation and termination schedule and utility reports.
4. Division 1 Section “Execution Requirements” for progress cleaning requirements.
5. Divisions 2 through 33 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
6. Division 31 Section “Dewatering” for disposal of ground water at Project site.
7. Division 32 Section “Asphalt Paving” for temporary roads and paved areas.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner’s construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water and Electric Power Service: Use charges are specified in Division 1 Section “Summary of Multiple Prime Contracts.”

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pavement: Comply with Division 32 pavement Sections.

B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.

C. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.

D. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."

E. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.

F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

G. Paint: Comply with requirements in Division 9 painting Sections.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Construction Manager Field Office: Provide a separate insulated, weather-tight, heated and air-conditioned field office for use by only Construction Management personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 20 persons at Project site. Construction Manager Field office to be maintained for the **DURATION** of the project.
   1. Furnish and equip each office as follows:

a. Provide two rooms each furnished with one desk and three chairs, four-drawer file cabinet, a plan table, a plan rack, 4-foot-square tack board and bookcase.
b. Provide one room of not less than 240 sq. ft. for Project meetings. Furnished room with conference table, 20 folding chairs, 3-foot by 4-foot white marker board, and 4-foot-square tack board.
c. Water cooler and private toilet complete with water closet, lavatory, and medicine cabinet with mirror.
d. Provide one 3.6 cu. ft. refrigerator.
e. Provide one microwave.
f. Provide one first aid kit: Johnson and Johnson Co., Model No. 25 or equal.
g. Provide one EcoTank Pro ET-5170 Wireless All-in-One Supertank Printer:
    1) Provide ink and supplies for the project duration
h. Provide 20-reams (10,000 sheets) of 8-1/2-inch by 11-inch, 24-pound laser paper
i. Provide one personal computer from the following options, including all required cables, with the following attributes:
    1) DELL or HP Business Classic PC
    2) 14th Generation Intel Core i7 Processor
    3) Windows 11 Pro 64-bit English
    4) MS Office 365
    5) 27” LCD monitor
    6) 64GB, DDR4, 2666MHz
    7) Internal SSD 2TB Hard Drive
    8) Wireless and Ethernet Networking
j. SSD External Hard Drive 2TB
k. Provide security bars at doors and security screens at all windows.
l. Provide stairs at each door.

2. Provide heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F.
3. Provide fluorescent light fixtures capable of maintaining average illumination of 25 fc at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.
4. Provide one large and two small trash cans with bags for project duration.
5. Janitorial Services: Provide janitorial services on a weekly basis for temporary Construction Manager field office.
6. The contents of the Field Office shall become the property of the Owner upon Substantial Completion of the Contract.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of the permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work and to limit site disturbance.

B. Provide each facility ready for use when needed to avoid delay. Do not remove without the approval of Construction Manager, and until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
2. Hose-Bib, Backflow-Prevention Devices: ASSE standard, nonremovable-type, backflow-prevention devices with ASME B1.20.7, garden-hose threads on outlet.
3. Water service piping to be copper tube or polyvinyl chloride (PVC) plastic pipe.
4. Provide one hose bib at point where temporary service connects to existing or new water service, after back-flow protection.
5. Provide one hose bib on each story of structure at earliest time possible in vicinity of Stair 1.
6. Provide protective enclosure if temporary service connects to new or existing service outside the building, complying with the following:
    a. Freeze-Protection Enclosures: Insulated and with heat source to maintain minimum internal temperature of 40 deg F when external temperatures reach as low as minus 34 deg F.
        1) Housing: Reinforced-aluminum or -fiberglass construction.
        2) Drain opening for units with drain connection.
        3) Access doors with locking devices.
        4) Insulation inside housing.
        5) Anchoring devices for attaching housing to concrete base.
        6) Electric heating cable or heater with self-limiting temperature control.

7) Precast concrete base of dimensions required to extend at least 6 inches beyond edges of enclosure housings. Include openings for piping.
8) Electrical Contract shall provide power to enclosure as indicated.
9) Class I-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.

7. Provide back-flow protection at point where service connects to new or existing service, complying with the following:
   a. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
   1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.

D. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Install electric power service overhead, unless otherwise indicated.
   2. Install main temporary electric panel at Staging Area per the Construction Implementation Plan (CIP-1) and a secondary temporary electric panel within 50 feet of the main temporary panel by the proposed building area (Exact location to be determined).

G. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
   1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
   2. Provide warning signs at power outlets other than 110 to 120 V.
   3. Provide 4-gang outlets, spaced so 75-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   2. Install lighting for Project identification sign.
   3. Provide one 100-W incandescent lamp every 20-feet in traffic areas.

4. Provide two 100-W incandescent lamps per story in stairways and ladder runs, located to illuminate each landing and flight.
5. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.

I. Telephone Service: Provide temporary telephone service in each field office for use by all construction personnel. Install one telephone line(s) for each field office.
1. Provide additional telephone lines for the common-use field office as follows:
   a. Provide a dedicated telephone line for facsimile machine and computer.
   b. Provide second voice line for general use.
2. At each telephone, post a list of important telephone numbers.
   a. Police and fire departments.
   b. Ambulance service.
   c. Contractor's home office.
   d. Architect's office.
   e. Engineers' offices.
   f. Owner's office.
   g. Principal subcontractors' field and home offices.

J. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in each facility.
1. Provide high speed internet line in CM field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earthwork."
3. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Hot-Mix Asphalt Paving."

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
   1. Provide temporary, directional signs for construction personnel and visitors.
   2. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section “Execution Requirements” for progress cleaning requirements.

H. Temporary Elevator Use: Refer to Division 14 Sections for temporary use of new elevators.

I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

J. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
   1. Comply with work restrictions specified in Division 1 Section “Summary.”

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
   1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates. Refer to Construction Implementation Plan (CIP-1).
   1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
   2. Maintain security by limiting the number of keys and restricting distribution to authorized personnel. Provide Owner with two sets of keys.

G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
   1. Prohibit smoking in construction areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction. Provide a Fire-Watch for work performed after hours.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
   4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may

have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section “Closeout Procedures.”

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Re-use of existing products.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 RELATED REQUIREMENTS

A. Section 012500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

B. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.3 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.1 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.2 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
1. Containing lead, cadmium, or asbestos.

2.3 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming Two or More Manufacturers **without** a Provision for Substitutions: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers **with** a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.4 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1 SUBSTITUTION LIMITATIONS

A. See Section 012500 - Substitution Procedures.

3.2 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.3 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.
   1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

F. For exterior storage of fabricated products, place on sloped supports above ground.

G. Provide off-site storage and protection when site does not permit on-site storage or protection.

H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

I. Comply with manufacturer's warranty conditions, if any.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Prevent contact with material that may cause corrosion, discoloration, or staining.

L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.2 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittals procedures.

B. Section 014000 - Quality Requirements: Testing and inspection procedures.

C. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

E. Section 017900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

F. Section 019113 - General Commissioning Requirements: Contractor's responsibilities in regard to commissioning.

G. Section 024100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

H. Section 078400 - Firestopping.

I. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural members.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

1.4 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

1.5 PROJECT CONDITIONS

A. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

D. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

E. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.6 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.1 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work,

assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
1. Review conditions of examination, preparation and installation procedures.
2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and _____.
2. Grid or axis for structures.
3. Building foundation, column locations, ground floor elevations, and _____.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.6 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.

I. Patching:
1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.

3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.7 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.8 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.9 SYSTEM STARTUP

A. Coordinate with requirements of Section 019113 - General Commissioning Requirements.

B. Coordinate schedule for start-up of various equipment and systems.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. See Section 017900 - Demonstration and Training.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Section 230593 - Testing, Adjusting, and Balancing for HVAC.

3.12 FINAL CLEANING

A. Execute final cleaning after Substantial Completion but before making final application for payment.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Clean filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Accompany Project Coordinator on Contractor's preliminary final inspection.

H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

I. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

END OF SECTION

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.

E. Develop and follow a Waste Management Plan designed to implement these requirements.

F. Methods of trash/waste disposal that are not acceptable are:
1. Burning on the project site.
2. Burying on the project site.
3. Dumping or burying on other property, public or private.
4. Other illegal dumping or burying.

G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 RELATED REQUIREMENTS

A. Section 012500 - Substitution Procedures.

B. Section 013000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

D. Section 016000 - Product Requirements: Waste prevention requirements related to product substitutions.

E. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

F. Section 017000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.3 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.

2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
2. Submit Report on a form acceptable to Owner.
3. Landfill Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
    c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Incinerator Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
    c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
5. Recycled and Salvaged Materials: Include the following information for each:
    a. Identification of material, including those retrieved by installer for use on other projects.
    b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
    c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
    e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
    a. Identification of material and how it was used in the project.
    b. Amount, in tons or cubic yards.

c. Include weight tickets as evidence of quantity.

7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

A. See Section 016000 and Section 012500.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 016000:
   1. Relative amount of waste produced, compared to specified product.
   2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
   3. Proposed disposal method for waste product.
   4. Markets for recycled waste product.

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PROCEDURES

A. See Section 013000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 015000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 016000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 017000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 017800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.2 RELATED REQUIREMENTS

A. Section 007200 - General Conditions and 007300 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
3. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Addenda.
   3. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Record Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.

3.2 OPERATION AND MAINTENANCE DATA

A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

B. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.4 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

3.5 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Operation and maintenance data.
      c. Field quality control data.
      d. Photocopies of warranties and bonds.

3.6 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SUMMARY

A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. HVAC systems and equipment.
   2. Plumbing equipment.
   3. Electrical systems and equipment.
   4. Conveying systems.
   5. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Items specified in individual product Sections.

1.2 RELATED REQUIREMENTS

A. Section 017800 - Closeout Submittals: Operation and maintenance manuals.

B. Section 019113 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

C. Other Specification Sections: Additional requirements for demonstration and training.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Commissioning Authority for review and inclusion in overall training plan.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.

4. Provide an overall schedule showing all training sessions.
5. Include at least the following for each training session:
    a. Identification, date, time, and duration.
    b. Description of products and/or systems to be covered.
    c. Name of firm and person conducting training; include qualifications.
    d. Intended audience, such as job description.
    e. Objectives of training and suggested methods of ensuring adequate training.
    f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
    g. Media to be used, such a slides, hand-outs, etc.
    h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
1. Include applicable portion of O&M manuals.
2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
1. Identification of each training session, date, time, and duration.
2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
4. Include Commissioning Authority's formal acceptance of training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
1. Format: DVD Disc.
2. Label each disc and container with session identification and date.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.

B. Conduct training on-site unless otherwise indicated.

C. Owner will provide classroom and seating at no cost to Contractor.

D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

E. Provide training in minimum two hour segments.

F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.

G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

I. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

3.3 TRAINING - SPECIFIC SYSTEMS REQUIRING TRAINING

A. Minimum trainging durations:
   1. Water to water heat pumps - 4 hours minimum
   2. Hot water propane boiler - 4 hours minimum
   3. Hydronic System, Pumping, Distribution & Controls - 4 hours minimum
   4. Terminal Fan Coil Units - 2 hours minimum
   5. BMS DDC Controls - General - 8 hours minimum
   6. HVAC Water Treatment - 2 hours minimum
   7. Total Training Time - 24 hours minimum.

END OF SECTION

SECTION 019113
GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with Contract Documents and the manufacturer’s recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
   4. Verify that the Owner’s operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.

C. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

D. The Commissioning Authority is employed by Construction Manager on behalf of Owner.

1.2 SCOPE OF COMMISSIONING

A. The following are to be commissioned:

B. Building envelope:
   1. Thermal and moisture integrity.
   2. Air tightness.

C. HVAC System, including:
   1. Air-Cooled Chiller
   2. Chilled Water/Hot Water PumpsMajor and minor equipment items.
   3. Hot Water Condensing Boilers
   4. Roof Top Units
   5. Variable Air Volumne Boxes
   6. Radiant Heat Panels
   7. Convectors
   8. Exhaust Fans
   9. Building Management System

10. Major and minor equipment items.
11. Piping systems and equipment.
12. Ductwork and accessories.
13. Terminal units.
14. Control system.
15. Vibration control devices.
16. Variable frequency drives.

D. Electrical Systems:
1. Variable Frequency Drives (VFD)

E. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.3 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: General startup requirements.

B. Section 017800 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

C. Section 017900 - Demonstration and Training: Scope and procedures for Owner personnel training.

D. Section 019114 - Commissioning Authority Responsibilities.

E. Section 230800 - Commissioning of HVAC: HVAC control system testing; other requirements.

1.4 REFERENCE STANDARDS

A. ASTM E1827 - Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door; 2022.

B. CSI/CSC MF - Masterformat; 2016.

C. PECI (Samples) - Sample Forms for Prefunctional Checklists and Functional Performance Tests; Current Edition.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures; except:
1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority, unless they require review by Architect; in that case, submit to Architect first.
2. Submit one copy to the Commissioning Authority, not to be returned.
3. Make commissioning submittals on time schedule specified by Commissioning Authority.
4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word 2010 preferred.
5. As soon as possible after submittals made to Architect are approved, submit copy of approved submittal to the Commissioning Authority.

B. Product Data: If submittals to Architect do not include the following, submit copies as soon as possible:
   1. Manufacturer's product data, cut sheets, and shop drawings.
   2. Manufacturer's installation instructions.
   3. Startup, operating, and troubleshooting procedures.
   4. Fan and pump curves.
   5. Factory test reports.
   6. Warranty information, including details of Owner's responsibilities in regard to keeping warranties in force.

C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

D. Startup Plans and Reports.

E. Completed Prefunctional Checklists.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Provide all standard testing equipment required to perform building envelope air tightness testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

C. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
   1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
   2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
   3. Calibration: According to the manufacturer’s recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

D. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

E. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
   1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner.

PART 3 EXECUTION

3.1 COMMISSIONING PLAN

A. Commissioning Authority has prepared the Commissioning Plan.
   1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
   2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:
   1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
   2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
   3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
   4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.2 DOCUMENTATION IDENTIFICATION SYSTEM

A. Give each submitted form or report a unique identification; use the following scheme.

B. Type of Document: Use the following prefixes:
   1. Startup Plan: SP-.
   2. Startup Report: SR-.
   3. Prefunctional Checklist: PC-.
   4. Functional Test Procedure: FTP-.
   5. Functional Test Report: FTR-.

C. System Type: Use the first 4 digits from CSI/CSC MF (Master Format), that are applicable to the system; for example:
   1. 2300: HVAC system as a whole.
   2. 2320: HVAC Piping and Pumps.
   3. 2330: HVAC Air Distribution.

D. Component Number: Assign numbers sequentially, using 1, 2, or 3 digits as required to accommodate the number of units in the system.

E. Test, Revision, or Submittal Number: Number each successive iteration sequentially, starting with 1.

F. Example: PC-2320-001.2 would be the Prefunctional Checklist for equipment item 1 in the HVAC piping system, probably a pump; this is the second, revised submittal of this checklist.

3.3 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority.

3.4 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
   1. No sampling of identical or near-identical items is allowed.
   2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
   3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
      a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
      b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
      c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
      d. Serial number of installed unit.
      e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
      f. Sensor and actuator calibration information.
   4. PECI (Samples) found at http://www.peci.org/library/mcpgs.htm indicate anticipated level of detail for Prefunctional Checklists.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
   1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
   2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
   3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
   4. If any Checklist line item is not relevant, record reasons on the form.
   5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.

6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
7. Submit completed Checklists to Commissioning Authority within two days of completion.
8. See Section 017000 - Execution and Closeout Requirements for additional general startup requirements.

C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
4. When asked to review the proposed Checklists, do so in a timely manner.

D. Commissioning Authority Witnessing: Required for:
1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
2. A sampling of non-primary equipment, as allowed by the commissioning plan.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.5 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.

3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.
5. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:
1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
2. Examples of Functional Testing:
a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
c. Systems are run through all the HVAC control system’s sequences of operation and components are verified to be responding as the sequence's state.
d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.
3. PECI (Samples) found at http://www.peci.org/library/mcpgs.htm indicated anticipated level of detail for Functional Tests.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.6 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:
1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
2. Verify that sensors with shielded cable are grounded only at one end.
3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
4. Tolerances for critical applications may be tighter.

D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.
2. Connect a signal generator in place of sensor.
3. Connect ammeter in series between transmitter and building automation system control panel.
4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
8. Reconnect sensor.
9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
11. If not, replace sensor and repeat.
12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
2. Pressure, Air, Water, Gas: 3 percent of design.
3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
4. Relative Humidity: 4 percent of design.
5. Barometric Pressure: 0.1 inch of Hg.
6. Flow Rate, Air: 10 percent of design.
7. Flow Rate, Water: 4 percent of design.
8. AHU Wet Bulb and Dew Point: 2.0 degrees F.
9. Hot Water Coil and Boiler Water Temperature: 1.5 degrees F.
10. Cooling Coil, Chilled and Condenser Water Temperatures: 0.4 degrees F.

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

3.7 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
2. Sampling is not allowed for:
   a. Major equipment.
   b. Life-safety-critical equipment.
   c. Prefunctional Checklist execution.
3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
7. If YY percent of the units in the second sample fail, test all remaining identical units.
8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
   1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
   2. Other points will be monitored by the Commissioning Authority using dataloggers.
   3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
   4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
   5. Graphical output is desirable and is required for all output if the system can produce it.
   6. Monitoring may be used to augment manual testing.

3.8 BUILDING ENVELOPE COMMISSIONING

A. General: Comply with the following procedural requirements:
   1. ASTM E1827 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door.

B. Verify that the building envelope has been sufficiently completed for testing to commence.

C. Conduct ongoing inspections as construction progresses to document satisfactory installation conditions. related to thermal and moisture integrity of the building envelope that become concealed upon completion of construction.

D. Submit a detailed narrative of proposed pressure test procedures prior to the test. Include a plan view showing proposed installation locations (personnel doors or other similar openings) for blower doors (or flexible ducts for trailer-mounted fans, if used).

E. Test the completed building and demonstrate that the air leakage rate of the building envelope does not exceed the specified requirements.
   1. Use equipment and methods necessary to produce indoor/outdoor pressure differential of 0.2 inches w.g..

F. Determine location and nature of undesirable air leakage pathways using methods specified in ASTM E1186-17 Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.

G. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
   1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.
   2. Insulation for remedying building envelope deficiencies evidenced as excessive air leakage is specified in Section 072100.
   3. Air barriers for remedying building envelope deficiencies evidenced as excessive air leakage are specified in Section 072600.
   4. Sealants for remedying building envelope deficiencies evidenced as excessive air leakage are specified in Section 079200.

3.9 OPERATION AND MAINTENANCE MANUALS

A. See Section 017800 - Closeout Submittals for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

END OF SECTION

SECTION 019114
COMMISSIONING AUTHORITY RESPONSIBILITIES

PART 1 GENERAL

1.1 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section covers the Commissioning Authority's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with Contract Documents and the manufacturer’s recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests performed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed O&M data submittals are specified.
   4. Verify that the Owner’s operating personnel are adequately trained: Formal training conducted by Contractor is specified.

B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.

C. Coordinate and direct all the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.

D. The Commissioning Authority is to be employed by Construction Manager on behalf of Owner.

E. The scope of commissioning activities is defined in Section 019113 - General Commissioning Requirements.

F. Contractor's responsibilities are defined in Section 019113 - General Commissioning Requirements.

1.2 DEFINITIONS

A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests and commissioning test demonstrations.

B. Commissioning Authority (CxA): A qualified and certified firm or individual responsible for delivery of the commissioning process.
   1. When applicable to a firm, indicates a entity certified through one or more of the organizations listed in the Quality Assurance article.

2. When applicable to an individual, equivalent terms with same meaning used in this Section include: Building Commissioning Professional (BCxP); Commissioning Professional (CxP); Commissioning Process Professional (CxPP).

C. Commissioning Process: Quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria.

D. Deferred Tests: Tests performed after Date of Substantial Completion, with Owner's approval, due to seasonal requirements, site conditions , or both, that prohibit the tests from being performed prior to achieving Substantial Completion.

E. Deficiency: Condition of a component, piece of equipment, or system that is not in compliance with the Contract Documents.

F. Integrated System Test: Test of multiple systems that are designed to dynamically function and operate in coordinated and properly sequenced fashion. Tests are intended to be conducted under various modes and through every specified sequence of operations.

G. Owner’s Project Requirements (OPR): A written document that details the Owner’s functional requirements of a project and the expectations of how it will be used and operated. It includes project goals, measurable performance criteria, cost considerations, applicable benchmarks, reference standards, success criteria, and supporting information.

1.3 REFERENCE STANDARDS

A. ASHRAE Guideline 1.1 - HVAC&R Technical Requirements for the Commissioning Process; 2007, with Errata (2012).

B. ASHRAE Std 202 - Commissioning Process for Buildings and Systems; 2018, with Addendum (2023).

C. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization; 2019.

1.4 SUBMITTALS

A. Commissioning Plan:
1. Submit preliminary draft for review by Owner and Architect within 30 days after commencement of Commissioning Authority contract.
2. Submit final plan not more than 90 days after commencement of construction, for issuance to all parties.

B. General Commissioning Specifications.
1. Submit preliminary draft for review by Owner and Architect at start of construction documents phase or within 30 days after commencement of Commissioning Authority contract, whichever is later.
2. Submit final draft for review by Owner and Architect not less than 6 weeks prior to bid date.

C. List of Prefunctional Checklists to be developed:
1. Submit preliminary list at start of construction documents phase or within 30 days after commencement of contract, whichever is later.

2. Submit final list not more than 60 days after start of construction.

D. Prefunctional Checklists:
1. Submit preliminary draft at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
2. Submit final draft to Contractor not less than 4 weeks prior to startup of particular items to be commissioned.

E. List of Functional Test procedures to be developed:
1. Submit preliminary list at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
2. Submit final list not more than 60 days after start of construction.

F. Functional Test Procedures:
1. Submit preliminary draft at start of construction documents phase or within 30 days after commencement of contract, whichever is later.
2. Submit final draft to Contractor not less than 4 weeks prior to startup of particular items to be commissioned.

G. Training Plan.

H. Recommissioning Manual: Submit within 60 days after receipt of Owner's instructions to proceed with preparation.

I. Commissioning Process Record: Submit to Contractor for inclusion with O&M manuals. Include, at a minimum the following:
1. Issues Log
2. CxA Site Visit and Cx Team Meeting Minutes
3. Summary Report

J. Final Commissioning Report: Submit to Owner. Include the following:
1. A statement that systems have been completed in accordance with Contract Documents, and that the systems are performing in accordance with the final Owner’s project requirements document.
2. Summary of issues, both resolved and unresolved, and any recommendations for resolution of remaining items.

K. Commissioning Firm's Qualification Statement.

1.5 QUALITY ASSURANCE

A. Commissioning Process: Conduct the commissioning process using ASHRAE Std 202 as the reference for applying the whole-building principles to facility elements.

B. Commissioning Firm Qualifications: Firm experienced in commissioning assemblies and systems specified to be included in scope of work of this Section.

C. Commissioning Plan: Prepare a plan that provides direction for commissioning tasks during construction phase of the project. Include, at a minimum, the following content at the level of detail appropriate to project scope and complexity:
1. General project information.
2. List of team members.

3. Description of the goals of the plan.
4. Scope of commissioning activities.
5. Proposed overall schedule, tied to project construction schedule.
6. Description of the commissioning process, including documents to be used for facilitating:
    a. Prefunctional checking and readiness verification.
    b. Start-up plan and procedures.
    c. Functional test plan and verification procedures.
    d. Retesting procedures.
    e. Management protocols for address deficiencies due to defective products or non-complying work.
    f. Management protocols for addressing other project-specific issues.
7. Progress reporting and log for tracking issues.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 COMMISSIONING PLAN

A. Prepare and implement the Commissioning Plan, covering commissioning schedule, Prefunctional Checklist and Functional Test procedures, coordination requirements, and forms to be used, for all parties in the commissioning process.
    1. Call and chair meetings of the Commissioning team when appropriate.
    2. Give Contractor sufficient notice for scheduling commissioning activities.
    3. Develop a comprehensive start-up and initial systems checkout plan with cooperation of Contractor and subcontractors.
    4. ASHRAE Guideline 1.1 may be used as a guide for the Commissioning Plan.
    5. Avoid replication of information included in the construction Contract Documents to the greatest extent possible.

B. Owner's Project Requirements: As defined above.
    1. Prepared By: Owner.
    2. Copy to be furnished to Commissioning Authority for use in preparation of the commissioning plan.

C. Review the construction Contract Documents for Contractor submittals of draft checklists, draft test procedures, manufacturer startup procedures, and other information intended for the use of the Commissioning Authority in preparing the Commissioning Plan.

D. Commissioning Schedule:
    1. Coordinate with Contractor anticipated dates of startup of each item of equipment and system.
    2. Contractor's scheduling responsibilities are specified in the construction Contract Documents.
    3. Revise and re-issue schedule monthly.
    4. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.

5. Deliver relevant Prefunctional Checklists and Functional Test Procedures to Contractor in time to avoid delay.

3.2 CONSTRUCTION CONTRACT DOCUMENTS

A. Review the OPR and BOD documents, and project design for commissioning provisions.

B. General Commissioning Specifications: Prepare general commissioning specifications coordinated with and integrated into Contract Documents prepared by Architect.
   1. Include general procedures applicable to all types of items to be commissioned and specific procedures for each type of work.
   2. Identify Contractor submittals needed for purposes of commissioning, that are not otherwise required to be submitted.
   3. Use SpecLink Section 019113 - General Commissioning Requirements.

C. Prefunctional Checklists: Develop detailed Checklists for each item to be commissioned.
   1. List of Checklists to be Developed: Prepare and maintain a detailed list of titles, not full text.
   2. The Checklist forms are intended to be part of the Contractor's Contract Documents.

D. Functional Testing: Develop detailed procedures for each item to be commissioned; submit for review by Owner and Architect.
   1. List of Test Procedures to be Developed: Prepare and maintain a detailed list of titles, not full text.
   2. The forms the Commissioning Authority will use to report Functional Test results are not intended to be part of Contractor's Contract Documents, but the Functional Test Procedures that must be executed by the Contractor must be made part of the Contract Documents, by modification if necessary.

E. Develop any other reporting forms Contractor will be required to use; if they are likely to require a substantially different amount of work than the Contractor can reasonably anticipate, they must be included in the construction Contract Documents.

F. If any part of the documents described above have not been developed by the bid date, coordinate with Architect the issuance of modifications to the construction Contract Documents

3.3 PREFUNCTIONAL CHECKLISTS

A. Prefunctional Checklists - Content: Prepare forms for Contractor's use, in sufficient detail to document that the work has been installed in accordance with Contract Documents and the manufacturer’s recommendations and instructions, and that it receives adequate operational checkout prior to startup.
   1. Prepare separate Checklists for each type of equipment, system, or other assembly, customized to the item.
   2. Identify each Checklist by using Contract Documents identification number or name, if any; if none, create unique identifiers for each Checklist; do not rely on Contractor to number checklists.
   3. Multiple identical or near-identical items may appear on a single Checklist provided there is space to record all required data for each separately; label each set of data uniquely.

4. Include space to record manufacturer name, model number, serial number, capacity and other relevant characteristics, and accessories and other features as applicable; include space to record "as specified", "as submitted", and "as installed" data.
5. Include space to record whether or not the required submittals have been received; list each separate type of submittal.
6. Include line items for each physical inspection to be performed.
7. Include line items for each operational inspection to be performed, such as checking switch operation, fan rotation, valve and damper stroke, and measuring actual electrical loads.
8. Include separate section for sensors and actuators, with space for documenting actual physical location and calibration measurements; provide a separate generic calibration checklist identified wherever referenced.
9. Include spaces to record that related Checklists for related work upon which this work depends have been completed.

B. Prefunctional Checklists - Format:
1. Provide a cover sheet showing name of equipment item or system, documentation identification number (see Documentation Identification Scheme), names of accessory components involved, and identification of related checklists.
2. Include on cover sheet space for Contractor's use in attesting to completeness; provide spaces for the signatures of the general contractor and each subcontractor or other entity responsible, customized to the project and the type of item.
3. Include on the cover sheet, above the signature block, the following statement: "The work referenced in this Checklist and other work integral to or dependent on this work is complete and ready for functional testing. The checklist items are complete and have been checked off only by parties having direct knowledge of the event." Include two checkboxes:
   a. "This Checklist is submitted for approval with no exceptions."
   b. "This Checklist is submitted for approval, subject to the attached list of outstanding items, none of which preclude the performance of safe and reliable functional tests. A statement of completion will be submitted upon completion of the outstanding items."
4. Use a consistent, tabular format for all Checklists, with one line per checklist activity.
5. For each line item, provide space for initials and date, and identification of the subcontractor or other entity responsible.

3.4 FUNCTIONAL TEST PROCEDURES

A. Develop test procedures in sufficient detail to demonstrate that functional performance is in accordance with Contract Documents, including proper operation through specified modes of operation where there is a different system response, including seasonal, unoccupied, warm-up, cool-down, part- and full-load regimes.
1. Obtain assistance and review by installing subcontractors.
2. Itemize each test sequence in step-by-step order, with acceptance criteria for each step and for the test as a whole.
3. Include test setup instructions, description of tools and apparatus, special cautions, and.
4. Avoid procedures that would void or otherwise limit warranties; review with Contractor prior to execution.
5. For HVAC systems, procedures may include energy management control system trending, stand-alone datalogger monitoring, or manual functional testing.

6. Obtain explicit approval of Contractor in regard to feasibility and safety prior to execution.

B. Functional Test Forms: Prepare and distribute forms in advance of testing. Use a consistent format to the greatest degree practicable. For each form, include the following:
   1. Document Identifiers:
      a. Date and Test Party Identifier: Identification of the date(s) of the test, and the party conducting it.
   2. Checklist of activities required of the Contractor prior to, during, and after the testing.
   3. Complete testing procedure information.
      a. Instrumentation: A listing of instrumentation and tools necessary to complete the test.
      b. Test Instructions: Step-by-step instructions of how to complete the test, including functionality to test, and conditions under which the tests should be performed. Include instructions for returning affected systems and equipment to their as-found state at the conclusion of the tests.
      c. Acceptance Criteria: Measurable pass/fail criteria for each step of the test, as applicable.
   4. Test Data:
      a. Results: Include side-by-side space for recording the expected system response and the actual response. Note observed readings, results, and adjustments.
      b. Deficiencies: Include space for a list of any discovered deficiencies and for an explation of how they were mitigated.
   5. "Yes/No" checkboxes to for documenting status of completion of required testing prerequisites and procedures.
      a. Functional Test Prerequisites Checkboxes: Include for applicable items:
         1) Related equipment has been started up, and start-up reports and Prefunctional Checklists have been submitted and approved, and are ready for Functional Testing.
         2) Control system functions for this and any interlocking systems have been programmed and are operable in accordance with Contract Documents, including final set points and schedules with debugging, loop tuning, and sensor calibrations completed.
         3) Incomplete items identified by Architect during closeout inspections have been corrected or completed.
         4) Vibration control report has been approved (if required).
      b. Functional Test Checkboxes: Include for applicable items:
         1) Procedures have been reviewed and approved by the affected installer.
         2) Safeties and operating ranges have been reviewed.
         3) False loading equipment, system and procedures are ready.
         4) Sufficient clearance around equipment for servicing has been provided.
         5) Original values of pre-test setpoints that need to be changed to accommodate testing have been recorded, .
   6. List of Attachments.
      a. A copy of the specified sequence of operation.
      b. A copy of applicable schedules and setpoints.
      c. A copy of the specified Functional Test Procedures is attached.
         1) Any other items on the Prefunctional Checklist or Start-up Reports that need to be re-verified.

7. Signature Block: Signature of the designated commissioning lead and the system and equipment installer attesting that the recorded test results are accurate.

C. Functional Performance Testing Reports: Use completed forms specified above, supplemented with additional information or explanations.
1. Precautions Taken: Identify and describe actual precautions taken and how they mitigated potential risks inherent in testing procedures.
2. Instrumentation Used: If necessary, amend the original list to report the actual instrumentation and tools used.
3. Description of Test Procedures: If necessary, amend in appropriate detail the original sequence of steps tp report actual steps taken to complete each functional performance test and the conditions under which the tests were performed.
4. Deficiencies: List any discovered deficiencies and how they were mitigated.

3.5 CONSTRUCTION PHASE

A. Coordinate the commissioning work with Contractor and Construction Manager; ensure that commissioning activities are being incorporated into the master schedule.

B. Perform site visits, as necessary, to observe component and system installations. Attend planning and job-site meetings to obtain information on construction progress. Review Contractor's meeting minutes for issues relating to the commissioning process. Assist in resolving discrepancies.

C. Commissioning Kick-Off Meeting: Plan and conduct a meeting early in the construction phase to review proposed commissioning schedule, activities, and responsibilities with parties involved. Require attendance by every member of the Commissioning Team.

D. Conduct periodic meetings as necessary to coordinate, resolve planning issues, and aid in resolution of deficiencies, minimizing the time spent by Contractor and Owner personnel; hold meetings at least monthly.

E. Submit periodic progress reports to Owner and Contractor.

F. Review Contractor shop drawing submittals applicable to systems being commissioned for compliance with commissioning needs; verify that Owner's responsibilities are clearly defined in warranties.

G. Review and approve submittals directly related to commissioning.

H. Deliver Prefunctional Checklists and Functional Test procedures to Contractor.

I. Verify satisfactory completion of Prefunctional Checklists by Contractor by reviewing checklists and by site observation and spot checking; provide formal approval when satisfactory.

J. Verify startup of all systems by reviewing start-up reports and by site observation; provide formal approval when satisfactory.

K. Coordinate, witness and approve Functional Tests performed by Contractor. Coordinate retesting until satisfactory performance is achieved.

L. Building Envelope Commissioning:

1. Develop for Contractor's and Subcontractors' use project-specific checklists, each targeted for commissioning the installation of a set of related components and systems that comprise the building enclosure.
2. Review the Contractor's and Subcontractors' project-specific performance implementation plans for building enclosure, including but not limited to the implementation and use of quality control/ quality assurance processes such as:
    a. Proposed date ranges for conducting pressure and thermographic tests.
    b. Daily field inspections.
    c. Work progress documentation.
    d. Weekly audits.
    e. Use of installation checklists for each crew.
3. Conduct construction observation of building enclosure systems, at initial installation of work, milestone observations throughout construction, performance testing and verification of components and systems, their interfaces, and whole building performance test (if required).
4. Weather Conditions Suitable for Building Envelope Testing:
    a. Winds and Temperature: As the test date approaches, monitor the weather forecast for the test site. Avoid testing on days forecast to experience high winds, rain, or snow. Monitor weather forecasts prior to shipping pressure test equipment to the site. Preferred ambient weather test conditions as stated in ASTM E779 are 0 to 4 miles per hour winds and an ambient temperature range of 41 to 95 degrees F. Based on current and forecast weather conditions, coordinate scheduling for the test to occur.
    b. Rain: Do not test during rain or if rain is anticipated during testing.
        1) If pneumatic hoses have been installed and exposed to rain prior to testing, ensure rainwater has not migrated into the hose ends.
        2) Orient all exposed pneumatic hose ends to keep them out of water puddles.
    c. Snow: Remove snow from around and on top of the building prior to testing.

M. HVAC Commissioning:
1. Gather and review the control sequences and interlocks and work with Contractor and design engineers until sufficient clarity has been obtained, in writing, to be able to prepare detailed Functional Test procedures.
2. Witness all or part of HVAC piping test and flushing procedures, sufficient to be confident that proper procedures were followed; document testing and include documentation in O&M manuals.
3. Witness all or part of duct testing and cleaning procedures, sufficient to be confident that proper procedures were followed; document testing and include documentation in O&M manuals.
4. Review TAB Plan prepared by Contractor.
5. Before TAB is executed, witness sufficient Functional Testing of the control system to approve it to be used for TAB.
6. Verify air and water systems balancing by spot testing, by reviewing completed reports, and by site observation; provide formal approval when satisfactory.
7. Analyze trend logs and monitoring data to verify performance.

N. Witness and document testing of systems and components over which the Commissioning Authority does not have direct control, such as smoke control systems, tests contracted directly by Owner, and tests by manufacturer's personnel; include documentation in O&M manuals.

O. When Functional Testing for specific systems or equipment is specified to be performed by the Commissioning Authority rather than the Contractor, perform such testing without assistance of Contractor.

P. Maintain a master deficiency and resolution log and a separate testing record. Provide written progress and test reports with recommended actions.

Q. Operation and Maintenance Data: Review submitted operation and maintenance data for completeness; provide formal approval if satisfactory.

R. Notify Contractor and Owner of deficiencies in procedures or results; suggest solutions.

3.6 TRAINING

A. Training Plan: Prepare a comprehensive Training Plan, incorporating draft training plans submitted by Contractor.
   1. Include a 2 hour session by the HVAC design engineer covering the overall HVAC system and equipment design concepts, with one-line schematic drawings.
   2. Include a 2 hour session by the Commissioning Authority on the use of the blank Prefunctional Checklists and Functional Test forms for re-commissioning purposes.
   3. Establish criteria for determining satisfactory completion of training.

B. Verify that training was satisfactorily completed; provide formal approval if satisfactory.

C. Contractor will perform video recording of training sessions.

3.7 CLOSEOUT

A. Commissioning Record: Use the same format and organization as specified for the O&M manuals.
   1. Include the Final Commissioning Plan and Final Report.
   2. For each product or system and equipment item, include the following organized as indicated, with separator tabs:
      a. Design intent documentation, furnished by Architect or others.
      b. Detailed operational sequences.
      c. Startup plan and approved startup reports.
      d. Filled out Prefunctional Checklists.
      e. Filled out Functional Test reports; trend logs and monitoring reports and analysis; other verification documentation.
      f. Training plan and training records.
      g. Recommissioning recommendations, including time schedule and procedures; include blank copies of all Prefunctional Checklists and Functional Test report forms.

B. Final Commissioning Report: Include:
   1. Executive summary.
   2. List of participants and roles.
   3. Brief facility description.
   4. Overview of commissioning scope and general description of testing and verification methods.
   5. For each item commissioned, an evaluation of adequacy of:

a. The product itself; i.e. compliance with Contract Documents.
b. Installation.
c. Functional performance; include a brief description of the verification method used and observations and conclusions from the testing.
d. O&M documentation, including design intent.
e. Operator training.

6. List of all outstanding non-compliance items, referenced to the specific functional test, inspection, trend log, etc., where the deficiency is documented.
7. List of unresolved issues, seasonal or deferred testing, and other concerns that could affect facility operation.
8. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. (about four to six pages).
9. Attach appendices containing all commissioning documentation, including logs, minutes, reports, deficiency lists, communications, findings, etc., except that specified to be part of the Commissioning Record.

C. Recommissioning Manual: Revise the Commissioning Plan documents, checklists, and Functional Test forms as necessary based on accepted recommendations of the final Commissioning Report. Provide step-by-step instructions for recommissioning, blank forms, and cross-references to O&M data needed during recommissioning.

3.8 POST-OCCUPANCY PHASE

A. Coordinate deferred and seasonal Functional Tests; verify correction of deficiencies.

B. On-Site Review: 10 months after Substantial Completion conduct on-site review with Owner's staff.
1. Review the current facility operation and condition of outstanding issues related to the original and seasonal commissioning.
2. Interview staff to identify problems or concerns they have operating the facility as originally intended.
3. Make suggestions for improvements and for recording these changes in the O&M manuals.
4. Identify areas of concern that are still under warranty or are the responsibility of the original construction contractor.
5. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

END OF SECTION

SECTION 024100
DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alteration purposes.

C. Abandonment and removal of existing utilities and utility structures.

1.2 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 011000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

C. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

E. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

F. Section 017419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

G. Section 312200 - Grading: Rough and fine grading.

H. Section 312323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.3 DEFINITIONS

A. Demolition: Dismantle, raze, destroy or wreck any building or structure or any part thereof.

B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.

D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Site Plan: Indicate:
   1. Areas for temporary construction and field offices.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Fill Material: See Section 312323.

PART 3 EXECUTION

3.1 DEMOLITION

A. Remove paving and curbs required to accomplish new work.

B. Within area of new construction, remove foundation walls and footings to minimum 2 feet below finished grade.

C. Remove concrete slabs on grade as indicated on drawings.

D. Remove other items indicated, for salvage, relocation, and recycling.

E. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 312200.

F. Remove, salvage, and reinstall existing Date Keystone as indicated on drawings.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with requirements in Section 017000.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of

unstable structures.

3. Provide, erect, and maintain temporary barriers and security devices.
4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
6. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
7. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

E. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

F. Hazardous Materials:
1. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

G. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.3 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
   1. Verify construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

C. Remove existing work as indicated and required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
   2. Remove items indicated on drawings.

D. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
   1. Prevent movement of structure. Provide shoring and bracing as required.
   2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work. If repair is determined by Architect to be unsuitable, remove and replace with new as directed.
   4. Patch to match new work.

3.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove materials not to be reused on site; comply with requirements of Section 017419 - Waste Management.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 030100
MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.1 Section Includes

A. Cleaning of existing concrete surfaces.

B. Resurfacing of concrete surfaces having spalled areas and other damage.

C. Scope of Work: As indicated on drawings.

1.2 Price and Payment Procedures

A. See Section 012200 - Unit Prices, for additional unit price requirements.

B. Repair Surface: By the square foot. Includes surface preparation, repair, finishing.

C. Unit Price for Surface Repair of Concrete Floor Slab: Include the cost for Surface Repair of Concrete Floor Slab for 10,000 square feet in the base bid. State on the bid form the unit price per square foot for surface repair of concrete floor slab, installed, in the event additional surface repair of concrete floor slab is required.

1.3 Reference Standards

A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.4 Submittals

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

C. Manufacturer's qualification statement.

D. Installer's qualification statement.

1.5 Quality Assurance

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum of 3 years of documented experience.

1.6 Delivery, Storage, and Handling

A. Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

PART 2 PRODUCTS

2.1 Cleaning Materials

A. Detergent: Non-ionic detergent.

2.2 Cementitious Patching and Repair Materials

A. Cementitious Repair Mortar, Trowel Grade: One- or two-component, factory-mixed, polymer-modified cementitious mortar.
   1. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
   2. Manufacturers:
      a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com.
      b. An approved equal.
      c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 Examination

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means acceptance of substrate.

3.2 Preparation

A. Prepare concrete surfaces to be repaired according to ICRI 310.2R, CSP 3.

3.3 Cleaning Existing Concrete

A. Provide enclosures, barricades, and other temporary construction as required to protect adjacent work from damage.

B. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
   1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
   2. Clean out cracks and voids using same methods.

C. The following are acceptable cleaning methods, in order from gentlest to less gentle:
   1. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.

2. Increasing the water washing pressure to maximum of 400 psi.
3. Adding detergent to washing water; with final water rinse to remove residual detergent.
4. Steam-generated low-pressure hot-water washing.

3.4 Concrete Surface Repair Using Cementitious Materials

A. Clean concrete surfaces, cracks, and joints of dirt, laitance, corrosion, and other contamination using method(s) specified above and allow to dry.

B. Apply coating of bonding agent to entire concrete surface to be repaired.

C. Fill voids with cementitious mortar flush with surface.

D. Apply repair mortar by steel trowel to a minimum thickness of 1/4 inch over entire surface, terminating at a vertical change in plane on all sides.

E. Trowel finish to match adjacent concrete surfaces.

END OF SECTION

SECTION 03 30 00 - CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to the work of this Section.

1.2 SUMMARY

A. Section includes but is not limited to the following as shown on the drawings and as specified herein:

1. Foundation systems including footings and walls and similar concrete.
2. Slabs on grade.
3. Stair pan fills.
4. Furnishing and installing all required anchors and inserts.
5. Placing in the forms all inserts, anchors, anchor bolts, bearing plates and the like furnished by other trades for casting into the concrete and cleaning of same after stripping of forms.
6. Protection of all inserts, anchors, hangers, sleeves and supports furnished and set by others for the attachment of other work to the concrete, or required to permit the passage of other work through the concrete.
7. Supply, fabricate and place all required reinforcing bars, mesh and other reinforcement for concrete where shown, called for, and/or required complete with proper supporting devices.
8. Erection and removal of all formwork required to properly complete the work.
9. Finishing of all concrete work as hereinafter specified.
10. Curing and protection of all concrete work
11. Floor sealers and dust-proofing of all areas exposed and/or covered with carpet.
12. Cutting, patching, grouting, repairing and pointing up as required.
13. Equipment pads as required.
14. All other work and materials as may be reasonably inferred and needed to make the work of this section complete.

B. Related Requirements:

1. Division 04 Section “Unit Masonry”
2. Division 05 Section “Structural Steel”
3. Division 05 Section “Metal Fabrications”
4. Division 06 Section “Rough Carpentry”

1.3 SUBMITTALS

A. Product Data: Submit data for proprietary materials and items, including the following:

1. Reinforcement
2. Supports for reinforcement
3. Forming accessories
4. Admixtures
5. Patching compounds
6. Curing compounds
7. Dry-shake finish materials
8. Others items as requested by Architect.

B. Shop Drawings; Reinforcement: Submit original shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures. The shop drawings shall be prepared only by competent detailers, checked by the contractor prior to submission.

1. The shop drawings shall show construction, contraction and isolation joint locations and the added reinforcement required at same.
2. Obtain and coordinate information for sleeves and openings in concrete, which are required for the work of other trades. Make coordinated drawings showing size and location of openings and sleeves and incorporate this information on the reinforcing drawings.
3. Only those splices indicated on the approved shop drawings will be permitted.
4. Provide elevations of all foundation walls and other structural elements to a minimum 1/4" scale.

C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

D. Contraction Joint Layout: Indicate proposed contraction joints required per applicable codes and drawings.

1. Location of contraction joints is subject to approval of the Architect.

E. The use of the Architect’s or Engineer of Record's electronic drawing files as a base for the reinforcement, formwork, and joint layout shop drawings will be permitted at the request of the detailer/designer upon completion and return of the waiver form. The use of the Architect’s or Engineer of Record's electronic drawing files as a base for shop drawing details will not be permitted. The detailer/designer will be responsible for

compatibility of the files with his hardware or software. The electronic files are not to be considered the contract documents, the design team makes no representation regarding the accuracy or completeness of the electronic files given to detailer/designer and their use will be at the detailer/designer's sole risk and without liability to the design team. The detailer/designer shall remove the project title box and all references to the structural drawings including drawing numbers and structural drawing sections and details. The detailer/designer shall also remove all reference to work not included in the concrete contract.

F. Scaling of the Architect's or Engineer of Record's drawings is not permitted. This applies to hard paper, electronic, and all other versions.

G. Samples: Submit samples of materials as requested by Architect, including names, sources and descriptions.

H. Laboratory Test Reports: Submit laboratory test reports for concrete materials, mix design test and microwave test.

I. Material Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements shall sign material certificates. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

J. Cold Weather and Hot Weather Concreting Procedures: Submit written descriptions of contractor's proposed cold weather and hot weather concreting procedures, when applicable.

K. Certification that pozzolanic materials conforms to ASTM C 618-01 (noting class C or class F), ASTM C 989 or ASTM C1240.

L. Certified recycled steel content. Provide cut sheets clearly indicating whether the rebar used meets the minimums for post-consumer OR post-industrial recycled contents. Or, if cut sheets are not available, obtain a written affidavit from the manufacturer stating the recycled content percentage and if the recycled content is post-consumer or post-industrial.

M. Formwork: Specify whether reusable, permanent, salvaged or new wood forms are to be used.

N. Recycled Aggregate: Provide laboratory reports indicating that aggregate conforms to ASTM C33 for structural concrete or ASTM D1241-00 for sub-base material. Provide cut sheets clearly indicating the source, total weight and volume of the recycled aggregate. If aggregate provided is a mix of virgin and recycled aggregates obtain a written affidavit from the manufacturer stating the recycled content percentage

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

D. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 117 “Standard Specifications for Tolerances for Concrete Construction and Materials and Commentary.”
2. ACI 211.1 “Standard Practice for Selecting Proportions for Normal, Heavyweight and mass concrete.”
3. ACI 211.2, “Standard Practice for Selecting Proportions for Structural Lightweight Concrete.”
4. ACI 214R, “Evaluation of Strength Test Results of Concrete.”
5. ACI 232.2R, “Use of Fly Ash in Concrete.”
6. ACI 233R, “Guide to Use of Slag Cement in Concrete and Mortar.”
7. ACI 234, “Guide for the Use of Silica Fume in Concrete.”
8. ACI 301 “Specifications for Structural Concrete.”
9. ACI 302.1R “Guide for Concrete Floor and Slab Construction.”
10. ACI 304R, “Guide for Measuring, Mixing, Transporting and Placing Concrete.”
11. ACI 305R “Hot Weather Concreting.”
12. ACI 306R-10 “Guide to Cold Weather Concreting.”
13. ACI 308.1 “Standard Specification for Curing Concrete.”
14. ACI 309R, “Guide for Consolidation of Concrete.”
15. ACI 311.4R, “Guide for Concrete Inspections.”
16. ACI 315, “Details and Detailing of Concrete Reinforcement.”
17. ACI 318 “Building Code Requirements for Structural Concrete and Commentary.”
18. ACI 347 “Guide to Formwork of Concrete.”
19. Concrete Reinforcing Steel Institute, (CRSI) “Manual of Standard Practice.”
20. CRSI-WCRSI, “Placing Reinforcing Bars.”
21. AWS D1.4, “Structural Welding Code Reinforcing Steel.”
22. The ACI Field Reference Manual, SP-15 shall be kept at the job site, and the practices set forth therein shall be strictly adhered to.
23. ASTM Standards as applicable in the building code of the local jurisdiction and as noted in this specification.
24. AASHTO T 318, “Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying.”

E. Concrete Testing Service: Owner will engage a testing laboratory acceptable to Architect and Engineer of Record to perform material evaluation tests and to design concrete mixes.

F. Materials and installed work may require testing and retesting at anytime during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

1.5 PROJECT CONDITIONS

A. The Contractor, before commencing work, shall examine all adjoining work on which this work is in any way dependent for proper installation and workmanship according to the intent of this specification, and shall report to the Architect or Engineer of Record any condition which prevents this contractor from performing first class work.

B. Protection of Footings Against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.

C. Protect adjacent finish materials against spatter during concrete placement.

D. Provide all barricades and safeguards at all pits, holes, shaft and stairway openings, etc., to prevent injury to workmen and others within and about the premises. Also provide all safeguards as required by the Building Code, OSHA, or any other departments having jurisdiction. Take full responsibility for all safety precautions and methods.

E. Procedure of Work: The contractor shall keep themself constantly informed as to the progress of the work in the field, materials and workers ready to start work immediately when conditions of preceding work are available or ready, wholly or in part, so as not to delay the progress of building work or to interfere with the progress of work of other contractors, and in any event the contractor shall, within 24 hours after notice from the Owner, proceed with such work as directed to maintain the uninterrupted progress of the work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct of plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient strength and thickness to withstand pressure of newly placed concrete without bow or deflection.

1. Use plywood complying with U.S. Product Standard PS-1 “B-B (Concrete Form) Plywood”, Class I, Exterior Grade or better mill oiled and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Preference shall go to salvaged or re-used Dimensional Lumber. Provide lumber dressed on at least 2 edges and one side for tight fit.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615 M, Grade 60.

B. Weldable Reinforcing Bars: ASTM A 706/A 706M, Grade 60.

C. Steel Wire and Welded Wire Reinforcement: ASTM A 1064. Galvanized at exterior locations, conditions permanently exposed to weather and/or water, and where noted on drawings (plan and/or sections).

D. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 , plain-steel bars, cut true to length with ends square and free of burrs.

E. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire reinforcement in place. Use wire bar type supports complying with CRSI specifications.

1. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 2), at a spacing not to exceed 4'-0" on center in either direction.

2.3 CONCRETE MATERIALS

A. Portland cement: ASTM C 150, Types I, II, or I/II. Total percentage of Portland Cement is NOT to exceed 75% of the cementitious content of each mix. Use one brand of cement throughout project, unless otherwise acceptable to Architect. Provide either fly ash or GGBF in mix per sections below.

a. Fly Ash: Cast-in-place concrete shall incorporate fly ash as a replacement for at least 25% (by weight) of the Portland cement. All design mixes must

be reviewed and approved by the Engineer of Record. Fly Ash shall not be used in conjunction with Ground Granulated Blast Furnace Slag.

b. Ground Granulated Blast Furnace Slag (GGBF): Cast-in-place concrete shall incorporate GGBF as a replacement for at least 40% (by weight) of the Portland cement. All design mixes must be reviewed and approved by the Engineer of Record. GGBF shall not be used in conjunction with Fly Ash.

c. Pozzolans and Slags: These must be completely accounted for in the design mix. Mix design must meet minimum design requirements set in the contract documents. Additional admixtures may be required to meet early strength requirements and alternative cementitious material goals. If a "blended cement" is used which already contains a certain percentage of Pozzolans or Slags this content may offset or entirely satisfy the minimum percentage required.

1) Coal Fly Ash: ASTM C 618 (Class C or Class F): ASTM C 618 (Note: Class F fly Ash will require higher amounts or air entraining admixtures than class C).
2) Blast Furnace Slag: ASTM C989
3) Silica Fume: ASTM C 1240
4) Rice Hull (or “husk”) Ash: ASTM C 618 Blended hydraulic cement, as defined by ASTM C 595 or ASTM C 1157

B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

1. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to Architect.
2. Normal weight Fine Aggregate: washed, inert, natural or manufactured or combination thereof, sand conforming ASTM C33 gradation.
3. Normal weight Coarse Aggregate: well graded crushed stone or washed gravel conforming to ASTM C33, sizes 57 for foundations and 67 for slabs and structure.

a. Recycled crushed concrete aggregate in concrete mixes is only to be used with approval of Engineer of Record. Recycled aggregate shall be used only as a substitute for coarse aggregate and must also be washed and well-graded, conforming to ASTM C33.
b. For sub-base, slabs on grade and non-structural applications and Recycled Aggregate Materials are NOT required to meet the ASTM C 33 standard. In addition to concrete rubble, glass, porcelain, and tire chips can be used as filler material. Any inert material conforming to ASTM D1241 is acceptable for the applications described in this paragraph.

C. Water: Free from oils, acids, alkali, organic matter and other deleterious material to conform to ASTM C94. ASTM C94 for gray water use in the production of ready mixed concrete per approval by the Engineer of Record.

D. Air Entraining Admixture: ASTM C 260.

1. Liquid air entrainment: Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a.	“Air Mix”	Euclid Chemical
b.	“AEA-92”	Euclid Chemical
c.	“Darex AEA”	W. R. Grace
d.	“MasterAir VR 10”	Master Builders

E. Water-Reducing Admixture: ASTM C 494.

1. Products: Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a.	“MasterPolyheed 997”	Master Builders
b.	“Euclid MR”	Euclid Chemical
c.	“WRDA 64”	W. R. Grace.

F. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F or Type G and containing not more than 0.05 percent chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a.	"Eucon 37, 1037 or Plastol 5000"	Euclid Chemical Co.
b.	"Rheobuild 1000"	Master Builders
c.	"MasterGlenium 7500"	Master Builders
d.	"Daracem-100"	W. R. Grace

G. Water Reducing, Non-Corrosive Accelerating Admixture: The admixture shall conform to ASTM C 494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures. Accelerating admixtures are not to be used as antifreeze agents. Accelerating admixtures are permitted only upon review by Engineer of Record.

1. Products: Subject to compliance with requirements, provide the following or equal approved by Engineer of Record:

a.	"Accelguard 80"	Euclid Chemical Co.
b.	"Daraset”	W. R. Grace
c.	“Pozzutec 20”	Master Builders.

H. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and contain not more than 0.05 percent chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a.	"Eucon Retarder 75"	Euclid Chemical Co.
b.	"Pozzolith 100XR"	Master Builders.
c.	"Plastiment"	Sika Chemical Co.
d.	"Daratard"	W.R. Grace.

I. Prohibited Admixtures: Calcium chloride, thyocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.

J. Certification: Written conformance to the above-mentioned requirements and the chloride ion content of admixtures will be required from the admixture manufacturer prior to mix design review by the Engineer of Record.

K. Corrosion Inhibitor: 30% calcium nitrite (where called for in the specifications or on the drawings). Subject to compliance with requirements, provide the following at 3 gal/cy:

1.	“Eucon CIA	Euclid Chemical
2.	“DCI”	W. R. Grace
3.	“Rheocrete CNI”	Master Builders.

L. Contractor will be required to provide information demonstrating successful use in prior placement involving all admixtures.

2.4 GROUT

A. Non-Shrink, Non-Metallic Grout: The non-shrink grout shall be a factory pre-mixed grout and shall conform to ASTM C1107, "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)." In addition, 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.

1. Products: Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a.	"Euco-NS"	Euclid Chemical Co.
b.	"Five Star Grout"	U.S. Grout Corp.
c.	"Masterflow 713 Plus"	BASF

B. High Flow Grout: Where high fluidity and/or increased placing time is required, use high flow grout. The factory pre-mixed grout shall conform to ASTM C1107, "Standard Specification for Packages Dry, Hydraulic-Cement Grout (Non-shrink)." In addition, 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 18" x 36" base plate.

1. Products: Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a.	"Euco Hi-Flow Grout"	Euclid Chemical Co.
b.	"Masterflow 928"	BASF
c.	“Five Star Fluid Grout 100”	Five Star

2.5 RELATED MATERIALS

A. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 1241, Size 57, with 100 percent passing a 1-1/2 inch sieve and 0 to 5 percent passing a No. 8 sieve.

B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 1241, Size 10, with 100 percent passing a 3/8 inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

C. Non-slip Aggregate Finish: Provide fused aluminum oxide grits, or crushed emery, as abrasive aggregate for non-slip finish with emery aggregate containing not less than 40% aluminum oxide and not less than 25% ferric oxide. Use material that is factory-graded, packaged, rustproof and non-glazing, and is unaffected by freezing, moisture, and cleaning materials.

D. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

E. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Waterproof paper
b. Polyethylene film
c. Polyethylene-coated burlap

F. Curing Compounds: The compound shall conform to ASTM C 309. Limit VOC content to 130 g/L. Use water-based curing compound. For surfaces receiving both a curing compound and additional flooring, verify that the curing compound and additional flooring are compatible.

1. Products: Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a.	“SealTight 1100”	W.R. Meadows
b.	“Kurez W VOX”	Euclid Chemical Co.
c.	“Everclear VOX”	Euclid Chemical Co.
d.	‘VOCOMP-25”	W.R. Meadows

G. Curing & Sealing Compounds: Only specify for slabs that will remain exposed, i.e. will not receive additional flooring. The compound shall conform to ASTM C1315. Limit VOC content to 130 g/L. Use water-based curing compound.

1. Products: Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a.	“Everclear VOX”	Euclid Chemical Co.
b.	“VOCOMP-25”	W.R. Meadows

H. Sealers/Hardeners: For use on concrete surfaces that will remain exposed. Slabs that will receive additional flooring do not require sealing or hardening. Sealers and hardeners must not yellow under ultra violet light after 500 hours of test in accordance with and have a maximum moisture loss of 0.039 grams per sq. cm. when applied at a coverage rate of 250 sq. ft. per gallon. Limit VOC content to 130 g/L. Use water- or vegetable-based product.

1. Products: Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a.	“Kure-N-Harden”	BASF

I. For concrete floors subjected to heavy vehicular traffic use a Liquid Sealer/Densifier: The product must be a high performance, deeply penetrating concrete densifier conforming to ASTMC836; odorless, colorless, VOC - compliant, non-yellowing siliconate based solution designed to harden, dustproof and protect and to resist black rubber tire marks on concrete surfaces. The compound must contain a minimum of 20% solids content of which 50% is siliconate

J. Evaporation Retardant:

1. Products Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a.	"Eucobar"	Euclid Chemical Co.
b.	"Confilm"	BASF

K. Certify that all curing compounds, sealers and hardeners are compatible with all adhesive products intended for attaching co-lateral floor material. In conformance with ASTM F 710, coordination with flooring manufacturer is required to insure concrete coatings will not obstruct the bond between the concrete and the adhesive. Insure coatings and adhesives are “benignly compatible” -- in other words, do not combine substances whose constituents are reactive. Reactivity releases VOCs and /or other toxic fumes.

L. Crack Sealer: Elastomeric liquid crack sealer resistant to water, gasoline, oil and salts.

1. Products: Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a. "Eucolastic 1NS" Euclid Chemical Co.
Maximum allowable depth of this product is ½".

M. Underlayment Compound: Free flowing, self-leveling, pumpable cementitious base compound.

1. Products: Subject to compliance with requirements, provide the following or equal approved by Engineer of Record:

a. "Flo-Top 90 or Super Flo-Top" Euclid Chemical Co.
b. "Ardex" Ardex Co.
c. "Underlayment 110" Master Builders

N. Bonding Admixture: The compound shall be a latex, non-rewettable type.

1. Products: Subject to compliance with requirements, provide one of the following or equal approved by Engineer of Record:

a. "Flex-Con" Euclid Chemical Co.
b. "SBR Latex" Euclid Chemical Co.

O. High Strength Polymer Repair Mortar: For form and pouring or large horizontal repairs, provide the flowable on-part, high strength repair mortar.

1. Products: subject to compliance with requirements, provide the following or equal approved by Engineer of Record:

a. "Eucocrete" The Euclid Chemical Co.
b. "Euco Speed MP" (Cold Weather) The Euclid Chemical Co.
c. “Emaco R” Master Builders.

P. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

a. “Daraweld C” W.R. Grace

Q. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Type IV for bonding hardened concrete to hardened concrete, and Type V for bonding freshly mixed concrete to hardened concrete.

R. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

S. Water: Potable.

2.6 PROPORTIONING AND DESIGN OF MIXES

A. Preparation of Design Mixes

1. All mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318 and prepared by a licensed testing laboratory approved by the owner, but paid for by the contractor. Submit mix designs on each class of concrete for review.
2. If previously used mixes are submitted, all materials shall be from the same sources and with the same brand names as the previously utilized mix.
3. If trial batches are used, the mix design shall be prepared by an independent testing laboratory and shall achieve an average compressive strength 1200 psi higher than the specified strength. This over-design shall be increased to 1.10f'c+700 psi when concrete strengths greater than 5000 psi are used.
4. The proposed mix designs shall be accompanied by complete standard deviation analysis or trial mixture test data.

B. Submit each proposed mix to the Architect and Structural Engineer for review at least 5 days prior to the pre-concrete conference. Do not begin concrete production until Architect and Engineer of Record has reviewed and approved mixes.

1. Submit Test reports for any pozzolans or slags indicating compliance with ASTM C 618 or ASTM C 989, respectively.
2. Provide cut sheets clearly indicating the percentages of pozzolans or slags used in the mix design as replacement for Portland cement. Or, if cut sheets are not available, obtain a written affidavit from the manufacturer stating the percentage.
3. Test reports for recycled aggregate indicating compliance with ASTM C 33. Provide cut sheets clearly indicating the percentage of aggregates used that are recycled. Or, if cut sheets are not available, obtain a written affidavit from the manufacturer stating the recycled content percentage and source or sources of the material.
4. Provide cut sheets clearly indicating the percentage of sub-base and filler aggregate materials that are recycled. Or, if cut sheets are not available, obtain a written affidavit from the manufacturer stating the recycled content percentage and source or sources of the material.

C. Design mixes to provide concrete with strength as indicated on drawings and schedules.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect and Engineer of Record. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect and Engineer of Record before using in work.

E. Admixtures:

1. Use water-reducing admixture or high range water-reducing admixture (superplasticizer) in all concrete as required for placement and workability.
2. Use non-corrosive, non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50°F (10°C).
3. Use high-range water-reducing admixture in pumped concrete, architectural concrete, parking structure slabs, fiber concrete, concrete required to be watertight, concrete with ultimate strength of 5,000 psi or more, and concrete with water/cement ratios below 0.50.
4. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Exposure category for exterior concrete is F1. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1-1/2 percent within following limits:

    a. Concrete structures and slabs exposed to freezing and thawing or deicer chemicals.
        1) 1-1/2” maximum aggregate: 4.5 percent (exposure class F1, moderate exposure); 5.5 percent (exposure class F2 and F3, severe exposure)
        2) 1” maximum aggregate: 4.5 percent (exposure class F1, moderate exposure); 6 percent (exposure class F2 and F3, severe exposure)
        3) ¾” maximum aggregate: 5 percent (exposure class F1, moderate exposure); 6 percent (exposure class F2 and F3, severe exposure)
        4) ½” maximum aggregate: 5.5 percent (exposure class F1, moderate exposure); 7 percent (exposure class F2 and F3, severe exposure)
        5) 3/8” maximum aggregate: 6 percent (exposure class F1, moderate exposure); 7.5 percent (exposure class F2 and F3, severe exposure)

    b. Other Concrete: (not exposed to freezing, thawing, or hydraulic pressure): 2 percent to 4 percent air.
    c. Interior concrete to receive hard troweling shall not be air entrained unless specifically approved by the Engineer.

5. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

F. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:

1. Concrete for precast slabs, precast beams, structural topping slab, caisson caps, caissons, poured in place slabs and grade beams, columns and walls, over water, on ground or exposed to weather: W/C 0.40.
2. Concrete on metal deck:

    a. With specified minimum compressive strength not greater than 5,000 psi: 0.40.
    b. With specified minimum compressive strength not greater than 7,000 psi: 0.35.

3. “Quick Dry” Concrete: 0.40.
4. Subjected to freezing and thawing; W/C 0.45.
5. Subjected to deicers/watertight: W/C 0.45.
6. Reinforced concrete subjected to brackish water, salt spray or deicers; W/C 0.40.

G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramp slabs and sloping surfaces: Not more than 3".
2. Reinforced foundation systems, including mud slabs below hydrostatic slabs: Not less than 1" and not more than 3".
3. Concrete containing HRWR admixture (superplasticizer): Not more than 9" unless otherwise approved by the architect. The concrete shall arrive at the job site at a slump of 2" to 3" (3" to 4" for concrete receiving a "shake-on" hardener or lightweight concrete), be verified, then the high-range water-reducing admixture added to increase the slump to the approved level.
4. Other Concrete: Not less than 1" or more than 4".

H. Chloride Ion Level: Chloride ion content of aggregate shall be tested by the laboratory making the trial mixes. The total chloride ion content of the mix including all constituents shall not exceed the limitations set forth in Table 4.4.1 of ACI 318 for concrete subjected to deicers or exposed to chloride in service (0.15% chloride ions by weight of cement).

2.7 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.

B. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

C. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required. When air temperature is between 85^{o}F (30^{o}C) and 90^{o}F (32^{o}C), reduce maximum mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90^{o}F (32^{o}C), reduce maximum mixing and delivery time to 60 minutes.

D. No water shall be added after mixing to concrete containing HRWR (Superplasticizer). If loss of slump occurs, the concrete treated with HRWR may be redosed as long as a "flash set" has not occurred. Redosage procedures must be discussed and approved by the Engineer of Record and the manufacturer.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

3.2 INSPECTION

A. Examine all work prepared by others to receive work of this section and report any defects affecting installation to the Contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.

3.3 CONCRETE

A. Concrete shall develop the minimum compressive strengths shown on drawings at 28 days when sampled and tested in accordance with ASTM C 31 and C 39 with the maximum slump in accordance with the approved mix design.

B. Concrete shall be in accordance with the requirements and specifications of "Building Code Requirements for Structural Concrete" as modified by the building code noted above.

C. Fly Ash Concrete & Slag Concrete: Concrete mixes containing high volumes of fly ash or Slag have slower set times and may take up to 56 days to reach full strength. The Engineer of Record, agency responsible for concrete mix design, the architect and the concrete subcontractor must coordinate to ensure that the form stripping schedule is consistent with the ability of the structure to support itself and all imposed construction loads.

3.4 FORMS

A. Design formwork to maximize its reusability, reduce resources devoted to formwork construction and minimize waste generated. Where appropriate choose alternative formwork systems (refer to sections listed above).

B. Design, erect, support, brace and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shapes, alignment, elevation and position. Maintain formwork construction tolerances complying with ACI 347. Provide Class A tolerances for concrete exposed to view. Provide Class C tolerances for other concrete surfaces.

C. Design formwork to be readily removable without impact, shocks or damage to cast-in-place concrete surfaces and adjacent materials.

D. Construct forms to size shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets,

chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back- up at joints to prevent leakage of cement paste.

E. 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. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, recesses, and the like, to prevent swelling and for easy removal.

F. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

G. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retightening forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

3.5 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials, which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain at least minimum coverage's for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

F. Repair of damaged epoxy-coating: When required, damaged epoxy-coating shall be repaired with patching material conforming to ASTM A775. Repair shall be done in accordance with the patching material manufacturer's recommendations.

G. Unless permitted by the Engineer of Record, epoxy-coated reinforcing bars shall not be cut in the field. When epoxy-coated reinforcing bars are cut in the field, the ends of the bars shall be coated with the same material used for repair of coating damage.

3.6 JOINTS

A. Construction Joints: Locate and install construction joints as indicated, or if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Architect.

B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise indicated.

D. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals and elsewhere as indicated.

1. Joint filler and sealant materials are specified in the section for "Related Materials"

E. Contraction (Control) Joints in Slabs-on-Ground: Maximum joint spacing shall be 36 times the slab thickness unless otherwise noted on the drawings. The dry cut saw shall be used immediately after final finishing and to a depth of 1-1/4". A conventional saw shall be used as soon as possible without dislodging aggregate and to a depth of 1/4 slab thickness.

1. Joint sealant material is specified in the section for "Related Materials".

3.7 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

C. Embedded Plates at Foundation Walls: Install plate at top of forms so that exterior face of steel plate is level and plumb. Use construction documents for locations, sizes and elevations.

3.8 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.

B. If form-release compound is required, coat contact surfaces of forms with a form-coating compound *before* reinforcement is placed.

C. Thin form-coating compounds only with thinning agent of type, and amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in- place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.9 CONCRETE PLACEMENT

A. Ready-mix concrete shall comply with the requirements of ASTM C 94 and ACI 304. All plant and transporting equipment shall comply with the concrete plant standards and truck mixer and agitator standards of the National Ready Mix Concrete Association.

B. Cold weather mixing procedures shall be submitted to the architect for approval.

C. Notify Architect and Owner’s Inspector at least 36 hours (1 1/2 regular working days) before each pour so that forms and reinforcing may be examined. Do not place concrete until inspection has been made or waived.

D. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

1. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions, and guard against spattering during placement.

E. General: Comply with ACI 304 “Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete,” and as herein specified.

1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

F. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 18" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints. Use internal vibrators penetrating both the top and preceding layers.

G. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

H. Use and type of vibrators shall conform to ACI 309 “Recommended Practice for Consolidation of Concrete.” Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

I. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

J. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

K. Slabs: Bring slab surfaces to correct level with straightedge and strikeoff. Use highway straightedge, bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. See also "MONOLITHIC SLAB FINISHES" below.

L. Maintain reinforcing in proper position during concrete placement operations.

M. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40^{o}F (4^{o}C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50^{o}F (10^{o}C), and not more than 80^{o}F (27^{o}C) at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Use only a non-corrosive, non-chloride accelerator. Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are NOT permitted.
4. Care must be taken to store water-based curing and sealing compounds where they will not freeze. In most cases, they cannot be reconstituted after thawing.

N. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F (32°C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
3. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.

3.10 FINISH OF FORMED SURFACES

A. Concrete mixes containing pozzolans or slags do not set at the same rate or with the same bleed water characteristic as plain Portland cement. Therefore attention must be directed to the proper procedures. Refer to ACI 232.2R and ACI 301.

B. Rough Form Finish: For formed concrete surface not exposed-to- view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

C. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed. Follow all requirements in ACI 301, Chapter 10 for smooth form finish. Surface preparation for surfaces receiving waterproofing must be approved by the waterproofing manufacturer prior to construction.

3.11 FLOOR FLATNESS/LEVELNESS TOLERANCES

A. FF defines the maximum floor curvature allowed over 24 in. Computed on the basis of successive 12 in. (300 mm) elevation differentials, FF is commonly referred to as the "Flatness F-Number".

B. FL defines the relative conformity of the floor surface to a horizontal plane as measured over a 10 ft. (3.05 m) distance commonly referred to as the "Levelness F-Number".

C. All floors shall be measured within 72 hours of being poured and in accordance with ASTM E 1155 "Standard Test Method for Determining Floor Flatness and Levelness Using the "F Number" System (Inch-Pound Units).

D. All slabs shall achieve the specified overall tolerance. The minimum local tolerance (1/2 bay or as designated by the architect) shall be 2/3 of the specified tolerances.

E. All elevated slabs shall achieve the specified FL tolerance before the removal of the forms.

F. All slabs on metal deck shall achieve the specified FF.

3.12 MONOLITHIC SLAB FINISHES

A. Float Finish: Apply float finish to slabs at crawl spaces, unless otherwise noted. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture. Surface shall achieve an FF 20 - FL 17 tolerance.

B. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system, unless otherwise noted. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance and with a surface leveled to an FF 25/ FL 20 tolerance (FL17 for elevated slabs). Grind smooth surface defects, which would telegraph through applied floor covering system.

C. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, and slab surfaces which are to be covered with membrane or elastic waterproofing, or sand-bed terrazzo, and as otherwise indicated, apply single trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming. Surface preparation for surfaces receiving waterproofing must be approved by the waterproofing manufacturer prior to construction

D. Sealers, Hardeners and Liquid Densifiers: Apply a coat of the specified compound to all EXPOSED interior concrete floors where indicated on the drawings. This surface must be continuously moist cured by a method satisfactory to the Architect. Apply and mechanically scrub compound into the floor in strict accordance with the manufacturer's printed instructions.

3.13 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
3. In order to avoid plastic or drying shrinkage cracks during warm, dry or windy weather, ACI 302 and ACI 308 shall be followed using wind breaks and sun shades when recommended. Evaporation retardant shall be as specified in Section 2.04.
4. Care must be taken to store water based curing and sealing compounds where they will not freeze. In most cases, they cannot be reconstituted after thawing.

B. Curing Methods: Perform curing of concrete by moisture curing, moisture-retaining cover curing, curing and sealing compound, and by combinations thereof, as herein specified.

1. Provide moisture curing by following methods.

    a. Keep concrete surface continuously wet by covering with water.
    b. Continuous water-fog spray.
    c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

2. Provide moisture-retaining cover curing as follows:

    a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Provide curing and sealing compound to exposed interior slabs not receiving additional flooring. A clear curing and sealing compound shall be used on exterior slabs, sidewalks and curbs not receiving a penetrating sealer.
4. Use the specified curing compound on surfaces to be covered with finish or coating material applied directly to concrete, such as liquid densifier/sealer, waterproofing,

dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials. Apply compound in accordance with manufacturer's direction.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of the specified curing compound or a continuous moist curing method approved by the architect.

E. Certify that all curing compounds, sealers and hardeners are compatible with all adhesive products intended for attaching co-lateral floor material. In conformance with ASTM F710, coordination with flooring manufacturer is required to insure concrete coatings will not obstruct the bond between the concrete and the adhesive. In addition, insure coatings and adhesives are "benignly compatible" -- in other words, do not combine substances whose constituents are reactive.

F. Sealer and Dustproofer: Apply a second coat of the specified curing and sealing compound to exposed interior slabs not subjected to vehicular traffic, noted on the drawings. These slabs must have received an initial coat of the curing and sealing compound.

3.14 REMOVAL OF FORMS

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50^{o}F (10^{o}C) for 12 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28-days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.15 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are intended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.16 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in- place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

D. Grout base plates and foundations as indicated using specified free-flowing non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.

E. Where high fluidity and/or increased placing time is required use the specified high flow grout. This grout shall be used for all base plates larger than 10 square feet.

F. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screeds, tamp, and finish concrete surfaces as scheduled.

G. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.17 CONCRETE SURFACE REPAIRS

A. Prior to all repairs, an as-built condition sketch and method of repair must be submitted to the Architect and Engineer of Record for review and approval.

B. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

C. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with a bonding grout containing the specified bonding admixture. Place patching mortar after while bonding grout is still tacky.

D. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

E. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discoloration's that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or pre-cast cement cone plugs secured in place with bonding agent.

F. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

G. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for tureens of slope, in addition to smoothness, using a template having required slope.

H. Repair finished unformed surfaces that contain defects, which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

I. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days, except at hydrostatic slabs.

J. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. The specified underlayment compound or repair toping may be used when acceptable to Architect.

K. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete

of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

L. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cutout holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

M. Structural Repair: All structural repairs shall be made with prior approval of the Engineer of Record as to method and procedure, using the specified polymer repair mortar and/or specified epoxy adhesive. Where epoxy injection procedures must be used, an approved low viscosity epoxy made by the manufacturers previously specified shall be used. In addition, all cracks shall be filled with the specified crack sealer or other method as approved by the Engineer of Record. All garage slabs shall be repaired prior to the slab being treated with the specified penetrating anti-spalling sealer.

N. Underlayment Application: Leveling of floors for subsequent finishes may be achieved by use of specified underlayment material. Underlayment application shall achieve the tolerances specified in "MONOLITHIC SLAB FINISHES" above.

O. Specified Polymer Horizontal Repair Mortar: All exposed floors shall be leveled, where required, with the specified self-leveling repair topping.

P. Repair Methods not specified above may be used, subject to acceptance of Architect.

3.18 FOUNDATION WALLS

A. The contractor shall form and leave openings in walls as shown on drawings and approved shop drawings for work of other contractors. These openings shall be temporarily closed and when so directed, the contractor shall point up in solid and neat manner with waterproofed cement.

3.19 WORK IN CONNECTION WITH OTHER TRADES AND CONTRACTS

A. Sleeves, pockets, openings, etc., shall be set in the concrete walls and arches as required for the mechanical trades as shown on approved shop drawings; these shall be encased or built into the concrete work and shall be properly placed and secured in position in the forms before concrete is placed.

B. Provide all chases, pipe slots, etc., required for the mechanical trades (see mechanical drawings), constructed as shown on the approved shop drawings.

C. Leave temporary access panels where required to install mechanical equipment as required by trade affected. Panels shall be formed with construction joints as specified. Details for such panels shall be submitted to Architect for approval.

D. Coordinate all penetrations, cutting, and patching with waterproofing contractor.

3.20 CUTTING AND PATCHING

A. Contractor for concrete work shall be responsible for all cutting, removing and patching work where concrete surfaces are not installed within the limits shown on the drawings or specified herein. All such work shall meet with the approval of the Architect or Engineer of Record.

B. Where cutting and patching is required to accommodate the work of other subcontractors, such cutting shall be done at the expense of said subcontractors but shall be performed by the contractor for concrete work.

C. The location and extent of cutting in completed concrete work and the patching thereof shall meet with the approval of the Architect or Engineer of Record.

3.21 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The Owner will employ a testing laboratory to perform tests and to submit test reports.

B. Provide special inspections per the applicable Building Code and the requirements of all applicable ACI standards.

C. At locations previously indicated in this specification and on the contract drawings, verify the use of non-magnetic materials. No magnetic materials are permitted in locations where prohibited by this specification or the contract drawings.

D. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect.

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; one test at point of discharge for each truck; additional tests when concrete consistency seems to have changed.
3. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each truck of air-entrained concrete.
4. Concrete Temperature: Test hourly when air temperature is 40^{o}F (4^{o}C) and below, and when 80^{o}F (27^{o}C) and above; and each time a set of compression test specimens made.

5. Compression Test Specimen: ASTM C 31; one set of 5 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
6. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 25 cu. yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimens tested at 7 days, three specimens tested at 28 days, and one specimens retained in reserve for later testing if required.

    a. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
    b. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
    c. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

7. Water Cementitious Ratio Test: Check water content of concrete in accordance with AASHTO T 318 “Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying”. Frequency of this test shall be the same as that of compressive strength tests, noted above.
8. Floor Preparation to Receive Resilient Flooring: For any concrete that receives resilient flooring, test concrete in accordance with ASTM F 710 prior to acceptance by owner.
9. Test results will be reported in writing to Architect, Engineer of Record, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

    a. Non Compliance: All test reports indicating non-compliance shall be faxed immediately to all parties on the test report distribution list and the hard copies submitted on different colored paper.
    b. Nondestructive Testing: Windsor probes, sonoscope, or other non-destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

10. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders

complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes but is not limited to the following as shown on the drawings and as specified herein:

1. Furnish and erect all columns, bearing plates, beams, girders, bracing and all related connections (bolted and welded).
2. Shop painting and field touch-up painting.
3. Erection bracing and supports, including steel wedges, shims or nuts required for leveling base plates.
4. Lintels and angles attached to structural steel as shown on drawings.
5. Unless specifically excluded, furnish and install all other items for structural steel work indicated on the drawings, specified, or obviously needed to make the work of this Section complete.

B. Related Requirements:

1. Division 03 Section “Cast in Place Concrete”
2. Division 04 Section “Unit Masonry”
3. Division 05 Section “Metal Deck.”
4. Division 05 Section “Metal Fabrications.”
5. Division 06 Section “Rough Carpentry.”
6. Division 07 Section “Waterproofing.”
7. Division 07 Section “Joint Sealants.”

C. Related Work Specified Elsewhere

1. Installation of loose lintels furnished under this section.
2. Miscellaneous metal work
3. Stair framing and hangers.
4. Field painting of structural steel, except as specified herein.
5. Fireproofing systems.

SECTION 035400
CAST UNDERLAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment for correcting floor flatness and leveling on concrete floor slabs.
   1. Use resinous type at all locations.

1.2 REFERENCE STANDARDS

A. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2018.

B. ASTM D413 - Standard Test Methods for Rubber Property—Adhesion to Flexible Substrate; 1998 (Reapproved 2017).

C. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.

D. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

E. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes; 2018.

F. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes; 2018.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

C. Manufacturer's Instructions.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.6 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Resinous Underlayment:
1. Universal Polymer Coatings, Inc.; UPC 5400 Underlayment Epoxy; www.upcoatings.com.
2. An approved equal.
3. Substitutions: See Section016000 - Product Requirements.

2.2 MATERIALS

A. Cast Underlayments, General:

B. Resinous Underlayment: Two-component, self-leveling, high build epoxy flooring system with the
1. Compressive Strength: 11,500 psi, tested per ASTM C579
2. Flexural Strength: 4,100 psi, tested per ASTM D790
3. Bond to Concrete: 350 psi, tested per ASTM D4541
4. Water Absorption: 10% maximum, tested per ASTM D413
5. Linear Shrinkage: 01% maximum, tested per ASTM C531
6. Flammability: 1.2 cm/min, tested per ASTM D635
7. Hardness, Shore D: 84, tested per ASTM D2240
8. 100% solids (+/- 1%)
9. Application temperature: 65-90 degrees F.
10. Thinning: Not required
11. Cure time: 8 hours (walking)

C. Aggregate: Dry, well graded, washed silica aggregate, in size and of characteristics acceptable to resinous underlayment manufacturer.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.

E. Primer: Manufacturer's recommended type.

F. Joint and Crack Filler: Latex-based filler, as recommended by manufacturer.

2.3 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Add aggregate for areas where thickness will exceed 1/2 inch. Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.

C. Mix cementitious underlayment to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION

A. Concrete: Mechanically prepare concrete to create a textured surface necessary to achieve the best bond; acceptable methods include shot-blasting, diamond grinding, scarifying, and scabbling. Do not use acid etching.

B. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

C. Vacuum clean surfaces.

D. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

E. Close floor openings.

3.3 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Broadcast silica aggregate onto resinous underlayment in strict accordance with manufacturer's instructions.

C. Place to required thickness, with top surface flat to 1/8 inch in 10 ft (Floor Flatness 50).

D. Properly installed underlayment must provide a substrate with a top surface level to 1/8 inch per 1 ft. (Floor Levelness 50).

3.4 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

3.5 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 040100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.1 Section Includes

A. Replacement of brick masonry units.

B. Repointing mortar joints.

C. Repair of damaged masonry.

1.2 Related Requirements

A. Section 040511 - Masonry Mortaring and Grouting.

B. Section 042000 - Unit Masonry: Brick masonry units.

1.3 Price and Payment Procedures

A. See Section 012200 - Unit Prices, for additional unit price requirements.

B. Brick Masonry Replacement: By the square foot. Includes all labor, material, and equipment required to replace damaged brick masonry.

C. Masonry Repointing: By the square foot. Includes all labor, material, and equipment required to repoint brick masonry.

D. Unit Price for Brick Masonry Replacement: Include the cost for Brick Masonry Replacement for 2,000 square feet in the base bid. State on the bid form the unit price per square foot for brick masonry replacement, installed, in the event additional brick masonry replacement is required.

E. Unit Price for Masonry Repointing: Include the cost for Masonry Repointing for 1,000 square feet in the base bid. State on the bid form the unit price per square foot for masonry repointing, installed, in the event additional masonry repointing is required.

1.4 Reference Standards

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.

1.5 Administrative Requirements

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
   1. Require attendance of parties directly affecting work of this section.
   2. Review conditions of installation, installation procedures, and coordination with related work.

1.6 Submittals

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Samples: Submit four samples of face brick units to illustrate matching color, texture and extremes of color range.

1.7 Quality Assurance - Masonry Work

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Restorer: Company specializing in masonry restoration with minimum three years of documented experience.

1.8 Delivery, Storage, and Handling

A. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

1.9 Field Conditions - Masonry Work

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.1 Mortar Materials

A. Comply with requirements of Section 040511.

2.2 Masonry Materials

A. Brick: Section 042000.

PART 3 EXECUTION

3.1 Examination

A. Verify that surfaces to be restored are ready for work of this section.

3.2 Preparation

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.

C. Separate areas to be protected from restoration areas using means adequate to prevent damage.

D. Cover existing landscaping with tarpaulins or similar covers.

E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

F. Protect roof membrane and flashings from damage with 1/2 inch plywood laid on roof surfaces over full extent of work area and traffic route.

3.3 Rebuilding

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. Support structure as necessary in advance of cutting out units.

C. Cut away loose or unsound adjoining masonry to provide firm and solid bearing for new work.

D. Build in new units following procedures for new work specified in other section(s).

E. Mortar Mix: Colored and proportioned to match existing work.

F. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.4 Repointing

A. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch depth or until sound mortar is reached.

B. Do not damage masonry units.

C. When cutting is complete, remove dust and loose material by brushing.

D. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave joint to match existing.

E. Moist cure for 72 hours.

3.5 Cleaning

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

END OF SECTION

SECTION 040511
MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mortar for masonry.

1.2 REFERENCE STANDARDS

A. ASTM C91/C91M - Standard Specification for Masonry Cement; 2023.

B. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.

C. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

D. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.

E. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used.

C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

1.4 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.5 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.1 MORTAR AND GROUT APPLICATIONS

A. Use only factory premixed packaged dry materials for mortar and grout, with addition of water only at project site.

B. Mortar Mix Designs: ASTM C270, Property Specification.
   1. Exterior, Non-loadbearing Masonry: Type N.
   2. Exterior Repointing Mortar: Type O.

2.2 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Type N.
   2. Color: Match existing.

B. Packaged Dry Material for Mortar for Repointing: Premixed Portland cement, hydrated lime, and graded sand; capable of producing Type O mortar in accordance with ASTM C270 with the addition of water only.
   1. Color: Match existing.

C. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.

D. Water: Clean and potable.

2.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Colored Mortar: Proportion selected pigments and other ingredients to match existing sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within two hours of mixing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install mortar to requirements of section(s) in which masonry is specified.

END OF SECTION

SECTION 042000
UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Clay facing brick.

B. Mortar.

C. Reinforcement and anchorage.

D. Flashings.

E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 040511 - Masonry Mortaring and Grouting.

1.3 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.

C. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.

D. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2023.

E. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

F. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.

G. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and masonry accessories.

C. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

1.5 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.1 BRICK UNITS

A. Manufacturers:
1. Belden Brick: www.beldenbrick.com.
2. An approved equal.
3. Substitutions: See section 016000 - Product Requirements.

B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
1. Color and texture: Modular Nutmeg Velour, 21-49, Other as manufactured by Belden Brick. Contact: Charlie DiBenedetto at 646-736-3158 or 929-626-3491.
2. Nominal size: match existing.
3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
4. Compressive strength: 17,000 psi, measured in accordance with ASTM C67/C67M.

2.2 MORTAR AND GROUT MATERIALS

A. Mortar: As specified in Section 040511.

2.3 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
1. Hohmann & Barnard, Inc: www.h-b.com.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

B. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry

veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.

1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
3. Vertical adjustment: Not less than 3-1/2 inches.

2.4 FLASHINGS

A. Metal Flashing Materials:

B. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
   1. Stainless Steel/Polymer Fabric Flashing - Self-adhering: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded on inward facing side to a sheet of polymer fabric that has a clear adhesive with a removable release liner.
      a. Manufacturers:
         1) Hohmann & Barnard, Inc: www.h-b.com/#sle.
         2) An approved equal.
         3) Substitutions: See Section 016000 - Product Requirements.

C. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

D. Termination Bars: Stainless steel; compatible with membrane and adhesives.

E. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.

F. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.5 ACCESSORIES

A. Weeps:
   1. Type: Polyester mesh.
   2. Color(s): As selected by Architect from manufacturer's full range.
   3. Manufacturers:
      a. Mortar Net Solutions; WeepVent: www.mortarnet.com.
      b. An approved equal.
      c. Substitutions: See Section 016000 - Product Requirements.

B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

3.2 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.3 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Brick Units:
1. Bond: Running.
2. Coursing: Three units and three mortar joints to equal 8 inches.
3. Mortar Joints: match existing.

3.4 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Remove excess mortar and mortar smears as work progresses.

C. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

D. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.5 WEEPS

A. Install weeps in veneer walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.6 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.7 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 1.77 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.8 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into

adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at nonmasonry construction.

2. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches minimum on vertical surface of backing:
   1. Anchor vertical leg of flashing into backing with a termination bar and sealant.

C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

D. Extend metal flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

3.9 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.

3.10 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

3.11 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

3.12 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formed steel stud exterior wall framing.

B. Exterior wall sheathing.

1.2 RELATED REQUIREMENTS

A. Section 072100 - Thermal Insulation: Insulation within framing members.

B. Section 072500 - Weather Barriers: Water-resistive barrier over sheathing.

C. Section 072600 - Vapor Retarders/Air Barriers: Vapor retarder and air barrier membrane installed over steel stud exterior wall framing to form air-tight building envelope.

1.3 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

D. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.

G. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2017.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to metal framing systems, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:

1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches .
2. Welded built-up members with plates thicker than 2 inches .
3. Column base plates thicker than 2 inches .

D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of all connections required by the drawings to be completed by structural steel fabricator (including comprehensive engineering analysis by a qualified professional engineer) to withstand loads indicated and comply with other information and restrictions indicated, unless noted otherwise.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use design method indicated on structural drawings.
3. Moment Connections: Fully restrained unless otherwise noted on drawings.

B. Lateral Framing Resisting System: Type used is indicated on structural drawings.

1.5 SUBMITTALS

A. Product Data: Submit data for each type of product indicated in the contract documents.

B. Shop Drawings: Submit shop drawings in accordance with the specifications as follows:

1. Show clearly all work, including relationship of structural steel to the adjacent work of other trades and to significant lines of finishes of other trades.

2. Do not fabricate or deliver work to the site before drawings reviewed by the Architect and Engineer of Record have been returned.
3. Before preparing steel shop drawings, submit proposed submittal schedule for review by Architect and Engineer of Record.
4. Before preparing steel shop drawings, submit for review a set of job standards showing all necessary joint details with full particulars of connection pieces, shop and field welds, and holes for erection bolts and permanent bolts. These shall include any moment and shear connections. Appropriate marks for designating all types and sizes of joint details shall be included. After approval of these job standards, the erection plans are to be submitted and shall be marked to indicate unmistakably the type and size of joint to be used for every beam connection. Do not order steel in advance of approval of the job standards and the erection plans with joint marks, except at own risk
5. Submit calculations for design of connections on job standards and all other connections such as moment and brace frames. Calculations shall be signed and sealed by a Professional Engineer licensed in the state in which the project is located.
6. Prepare remainder of steel shop drawings after approval of job standards and erection plans. Drawings submitted prior to approval of job standards will be returned without review.
7. Prepare shop drawings in conformance with the applicable procedures shown in "*Detailing for Steel Construction*," latest edition, published by AISC. Prepare shop drawings under the supervision of competent engineering personnel, licensed by the state in which the construction is to take place. During the preparation of shop drawings, and prior to submittal, coordinate and cross check all shop drawings, including those prepared by subcontractors, for compliance with the Contract Documents.
8. Indicate clearly the size and grade of steel for each component. Identify rolled shapes, tubes and plates by using the standard designations used in "Steel Construction Manual" Latest Edition, by AISC.
9. Indicate welds and nondestructive tests by using the symbols conforming to AWS A2.4 "Symbols for Welding and Nondestructive Testing." Where necessary for clarity, indicate welding procedure designations or other data in the tail of the welding symbol.
10. Show explicitly the type of connection used in each location, including the grade, size, and number of bolts; the type, number, position, designation and orientation of each washer; and the size of each hole, whether slotted or round. Ensure that adequate wrench clearance for correct bolt tightening is provided and note special bolt tightening sequences where applicable and necessary.
11. Show all camber dimensions in the shop drawings. Where specific camber is not shown in the drawings, note on each affected shop drawing that such members are to be fabricated with the natural camber up.
12. Show holes required for securing work specified in other sections to structural steelwork, as well as all holes required for passage through structural steelwork of work of other trades. Provide field work drawings for all such holes not shown in

shop or erection drawings. Addition of, or change in size or location of openings will not be permitted without prior approval.

13. Use bolted connections wherever possible; avoid field welding unless otherwise noted on drawings.
14. Make details in such a way as to avoid having steel, connections, bracing, bolts, etc., interfere with architectural details or in any way reduce the areas of shafts, openings, clearances, etc.
15. Detail and schedule cleaning and painting data and requirements, including specific indication of "no-paint" areas.
16. The use of the Architect's or Engineer of Record's electronic drawing files as a base for the erection shop drawings will be permitted at the request of the structural steel detailer upon completion and return of the waiver form. The use of the Architect's or Engineer of Record's electronic drawing files as a base for shop drawing details will not be permitted. The structural steel detailer will be responsible for compatibility of the files with his hardware or software. The electronic files are not to be considered the contract documents, the design team makes no representation regarding the accuracy or completeness of the electronic files given to the structural steel detailer and their use will be at the structural steel detailer's sole risk and without liability to the design team. The structural steel detailer shall remove the project title box and all references to the structural drawings including drawing numbers and structural drawing sections and details. The structural steel detailer shall also remove all reference to work not included in the steel contract.
17. Scaling of the Architect's or Engineer of Record's drawings is not permitted. This applies to hard paper, electronic, and all other versions.
18. Show clearly the size and location of each member and the erection mark assigned to each member. Show each field connection with all data and details necessary for assembling the structure. Direct special attention to the possible need for special guying, bracing, or shoring to prevent deformation of existing or new structure due to stresses caused by erection procedures and equipment, by construction loadings, and by forces of natural phenomena.
19. Prepare, keep up-to-date, and submit a complete drawing index cross-referencing each assigned piece mark with the drawing number in which the piece is detailed. Detail drawings submitted without an up-to-date index and the applicable erection drawing(s) showing the location of each piece will be deemed an incomplete submission and will not be accepted as subject to any agreed shop drawing review schedule.
20. Prepare anchor bolt and base plate erection drawings containing complete location and placing details, including details of all templates. Provide anchor bolt erection drawings to the concrete trade in advance of applicable concrete work and in coordination with concrete construction sequence.
21. Submit, in writing, any proposed deviations from the Contract Documents, prior to the submission of shop drawings showing the proposed deviation. Submit requests for deviations on the steelwork subcontractor's letterhead. Deviations not identified, or identified only in letters of transmittal or in shop drawings or both,

without the required written request, may not be accepted, and shall be sufficient cause for the architect to return each shop drawing containing such deviations without further action. Acceptance of shop drawings containing deviations not detected by the architect during shop drawing review shall not relieve the steelwork subcontractor from responsibility to conform strictly to the Contract Documents.

22. Prior to resubmission of shop drawings with additions or corrections, circle or bubble and identify all changes. Drawings submitted without each change being clearly identified are subject to return for resubmission.
23. Prior to making shop drawings for any portion of the work involving alterations to an existing structure, make all necessary field observations, measurements and surveys of existing conditions. If probes are required to accomplish such measurements, give timely notice where probes will be required.

C. Submit certified copies of each survey conducted by a surveyor licensed by the state in which the construction is to take place and employed by the structural steel subcontractor. Survey shall show elevations and locations of base plates and anchor bolts to receive structural steel, and final elevations and locations for major members. Indicate discrepancies between actual installation and Contract Documents.

D. Reports:

1. Submit certified copies of mill test reports for all steel furnished. Perform mechanical and chemical tests for all material regardless of thickness or use.
2. Submit certification of recycled steel content. Certification shall clearly indicate post-consumer AND post-industrial recycled steel content for the particular member or members used.
3. Submit anchor bolt checking certification as required.
4. Submit qualification certificates of all welders who will perform work on the project.
5. Submit survey of erected steelwork as required.

E. Submit verification of bio-degradable or low VOC, and low Hazardous Air Pollutants (HAPS) cleaning solutions. Provide a cut sheet for all cleaning solutions used in the surface preparation of steel components. Highlight VOC limits and chemical component limits.

1.6 QUALITY ASSURANCE

A. Except as modified by this specification, comply with the applicable provisions and recommendations of the following codes and standards:

1. AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings".

2. AISC "Code of Standard Practice for Steel Buildings and Bridges" latest edition.
3. AISC “Seismic Provisions for Structural Steel Buildings”, latest edition.
4. Industrial Fasteners Institute "Handbook of Bolt and Bolted Joints" latest edition.
5. RCSC "Specifications for Structural Joints Using High-Strength Bolts."
6. ASTM Standards as applicable in the building code of the local jurisdiction and as noted in this specification.
7. AWS D1.1, "Structural Welding Code."
8. AWS A5.18 & A5.28, Structural Welding Code for GMAW
9. SSPC "Painting Manual, Volume 2, Systems and Specifications.", Latest edition.

B. Qualifications for welding work shall be as follows:

1. Qualify welding procedures and welding operators in accordance with the AWS "Standard Qualification Procedure."

   a. Include amended requirements of the building code as noted above.

2. Submit certification that all welders to be employed in work are AWS qualified. If re-certification of welders is required, retesting will be responsibility of structural steel subcontractor.

   a. Include licensing requirements as per the building code noted above and local jurisdiction.

1.7 TESTING AND INSPECTION

A. Special Inspection as required by the applicable Building Code of all structural steelwork in the shop and field will be performed by an inspection agency retained by the Owner at no expense to the Contractor. The inspection agency shall work under the direction of the Owner. Contractor shall provide the inspection agency with the following:

1. Schedule of all work in both shop and field with at least ten days' written notice before commencement of either activity.
2. A complete set of approved shop and erection drawings.
3. Cutting lists, order sheets, material bills, shipping bills and mill test reports.
4. Information as to time and place of all rollings and shipment of material to shops.
5. Representative sample pieces as requested by the testing agency.
6. Full and ample means and assistance for testing all material.
7. Proper facilities, including scaffolding, temporary work platforms, etc., for inspection of the work in the mills, shop and field.

B. Each person installing connections shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the inspector can refer back to the person making the connection.

C. The following minimum criteria shall be adhered to in testing of welds and bolts:

1. All welds and bolts shall be examined by visual means.
2. 25% of all welds, selected randomly, shall be measured.
3. Bolted joints shall be verified per the RCSC “Specification for Structural Joints Using High-Strength Bolts,” Section 9, based on installation method.
4. All welds subject to tensile stress shall be examined by the Ultrasonic Method for 100% of their length.
5. 10% of all manual fillet welds shall be tested by the magnetic particle method.
6. 1'-0" at each end of automatic fillet welds shall be tested by the magnetic particle method.
7. 100% of groove welds shall be tested by the ultrasonic method.

D. Shop inspection will include examination of steel for straightness and alignment, fissures, mill scale, and other defects and deformities, as described in ASTM A6, examination of fabricated pieces for conforming to approved shop drawings, testing of bolts and welds, and inspection of shop painting. All shop welds shall be visually inspected and spot tested using Ultrasonic Method ASTM E 114 and AWS, Chapter 6, Part C. All inspected welds shall be identified by the inspector.

E. Field inspection will include examination of erected steel for welding, proper fitting and tensioning of bolts, alignment, trueness and plumbness, touching-up of shop coat, level of billets and base plates.

F. Inspection of welding will be such as to assure that the work is within the quality requirements specified below and elsewhere in this section of the specifications and will include:

1. Ascertainment that the electrodes and flux used for the SAW, GMAW and FCAW welding processes conform to the requirements of this section of the specifications.
2. Ascertainment that the approved welding procedures and sequence are followed without deviation, unless specific approval for change is obtained from the Engineer of Record.
3. The testing agency shall be prepared to utilize the following approved methods of testing:

    a. Liquid penetrant inspection: ASTM E 165.
    b. Magnetic particle: ASTM E 1444.
    c. Radiographic inspection: ASTM E 94 and E 1032.
    d. Ultrasonic inspection: ASTM E 114 and AWS, Chapter 6, Section C.

G. When defects are revealed, additional inspection by whatever method is deemed necessary by the inspector, shall be performed to the extent necessary to assure that the full amount of defect has been located. No further work shall be done on the assembly or sub-assembly in question until all the necessary corrections have been

made. Defects shall be repaired, using the same welding procedure that was used initially in making the weld, unless otherwise approved by the Engineer of Record. Inspection of the repaired weld shall be by the same method that was used to reveal the defect. A second repair of a defective area shall not be made without approval of the Engineer of Record.

H. Apparatus and procedures for measuring required tension in pretensioned and slip-critical high strength bolted connections shall be furnished and maintained by the steel contractor, in accordance with the RCSC “Specification for Structural Joints Using High-Strength Bolts,” and shall be approved by the inspection agency. The inspection agency shall observe the pre-installation verification testing required and shall ensure by routine observation that the bolted installations conform to the approved pretensioning method being used. The steel contractor shall provide a laborer and scaffolding as required for the testing of connections by the inspection agency, and shall, at his own expense, furnish such facilities and provide such assistance as may be required for proper inspection.

I. A distinguishing mark will be placed on all work that has been inspected and approved. Material or work that is not acceptable will be designated by words such as "REJECT" or "REPAIR" marked directly on the material or work.

J. Inspection of Shop Painting:

1. Visually evaluate surface preparation by comparison with pictorial standards in accordance with SSPC-Vis 1.
2. Measure dry film thickness of each coat with a magnetic film thickness gauge in accordance with SSPC-PA 2.
3. Visually inspect dried film for runs, sags, dry spray, overspray and missed areas.
4. Repair defective or damaged areas in accordance with painting requirements specified. Architecturally exposed structural steel shall be free of runs and holidays. Make repairs to shop or field coat as directed.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work. Minimize the disturbances to site and soil conditions.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time not to delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members in a safe, dry, off ground location, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration, discoloration or staining.

D. Do not store materials on structure in a manner that might cause distortion or damage to members of supporting structures. Repair or replace damaged materials or structures as directed.

1.9 PROJECT CONDITIONS

A. The structural steel contractor shall coordinate the structural steel work with the work of other Contracts. Verify all dimensions and details of this Contract and those of other Contracts that affect the work before proceeding. Any discrepancies shall be immediately reported to the architect.

B. Be fully responsible for the accurate installation of the work. Any discrepancy which arises from his failure to execute the work in conformity to the drawings and specifications shall be properly remedied at the contractor's own expense and in a manner acceptable to the architect.

C. Locate dimensionally on setting plans all anchor bolts, inserts, bearing and base plates, etc., and prepare and deliver all required templates and fully dimensioned setting plans in time for the proper execution of the work. Anchor bolts shall be set by another subcontractor. The structural steel contractor shall check all such settings for correctness after they have been cast in place, and before proceeding with erection work.

D. Report to the architect and certify compliance with the above checking requirements in writing and indicate any inaccuracies found in the location of anchor bolts or inserts, and corrections which must be made to their installation. Any inaccuracies not included in the report and found during or after steel erection shall be the responsibility of the structural steel contractor and the cost of corrective measures shall be borne by the structural steel contractor.

E. Use base lines, bench marks, or other standards for survey work that have been provided or verified by others. If permanent building bench marks have been established, these will be used for field checking.

F. Coordinate with all other trades to insure that work of this section does not cause undue conflict. Insure that location of erection devices such as cranes, derricks, booms or hoists, does not cause over-stresses to steel frame to work previously placed by other trades or to existing structures. When required, retain the services of a licensed professional engineer to ascertain that erection devices do not create unsafe conditions or cause overstresses.

G. Ensure full co-ordination with other related trades and professions.

1.10 SUBSTITUTION

A. Architect reserves the right to require substitute shapes of other sizes than those indicated on the drawings when it is apparent that the shapes specified cannot be furnished within the time required for the progress of construction. Make said substitutions without additional cost to the owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel shapes, including structural steel wide flange and structural tee rolled shapes, channels, angles, plates, pipe, and hollow structural sections: As noted on structural drawings.

B. High Strength Bolts: As noted on Structural Drawings.

C. Filler metal for welding electrodes. As noted on structural drawings.

D. Structural steel primer paint: rust inhibitive primer conforms to the following criteria

1. Coordinate all paint requirements with specification section 099000 and 078123.
2. Demonstrate a minimum of adhesion as classified by 4B of ASTM D 3359 method A
3. Demonstrate a minimum opacity as determined by ASTM D 2805
4. Demonstrate corrosion resistance per standards ASTM B 117 & ASTM D 5894
5. “Slip Critical” compatible rating where applicable
6. The product shall not contain any of the prohibited compounds as listed in Green Seal *Standard for Paintings and Coatings*, GS-11, latest edition and in Master Painters Institute (MPI) *Green Performance Standard*, GPS-1-08.
7. The product shall meet the VOC limits as set forth in the MPI Green Performance Standard, GPS-1-08, with a maximum allowable VOC of 340 g/L for rust preventative coatings. Limits are expressed in THINNED state. Preference shall be given to products with the least crystalline silica content.
8. The product shall meet all the requirements of MPI Standards: 23, 26, 76, 79, 95, 107, 135, 173, 275. Products not listed with MPI are acceptable if and only if they meet the same environmental criteria for the same product category.

    a. Exterior exposed steel, normal conditions: Use alkyd or polyamide solvent based paints (MPI #’s 76, 79 & 101)
    b. Interior exposed steel: Use water based paint (MPI # 107)
    c. Special Applications, highly corrosive environments: Use zinc rich paints (MPI #’s 20 & 200)

E. Structural steel field paint for exposed members: rust inhibitive primer conforms to the following criteria

1. Coordinate all paint requirements with specification section 099000.
2. Demonstrate a minimum of adhesion as classified by 4B of ASTM D 3359 method A
3. Demonstrate a minimum opacity as determined by ASTM D 2805
4. Demonstrate corrosion resistance per standards ASTM B 117 & ASTM D 5894
5. “Slip Critical” compatible rating where applicable.
6. The product shall not contain any of the prohibited compounds as listed in Green Seal *Standard for Paintings and Coatings*, GS-11, latest edition and in the Master Painters Institute *Green Performance Standard*, GPS-1-08.
7. The product shall meet the VOC limits as set forth in the MPI Green Performance Standard, GPS-1-08, with a maximum allowable VOC of 400 g/L for rust preventative coatings. Limits are expressed in THINNED state. Preference shall be given to products with the least crystalline silica content.
8. The product shall meet all the requirements of MPI Standards: 23, 26, 76, 79, 95, 107, 135, 173, 275. Products not listed with MPI are acceptable if and only if they meet the same environmental criteria for the same product category. Products not listed with MPI are acceptable if and only if they meet the same environmental criteria for the same product category.

    a. Exterior exposed steel, normal conditions: Use alkyd or polyamide solvent based paints (MPI #’s 23, 79)
    b. Interior exposed steel: Use water based paint (MPI # 107)

PART 3 - EXECUTION

3.1 FABRICATION

A. All shop connections shall be high strength bolted unless specifically shown otherwise. Fabricate work in shop in as large assemblies as practicable. Use welded connections ONLY where shown on drawings. If a bolted connection is not possible, obtain written approval from the Engineer of Record for the welded connection.

B. Camber: As indicated on drawings.

C. Mill column ends and bearing stiffeners to give full bearing over the cross section. Plane contact surfaces of bearing plates when required by the AISC Specifications. It is not necessary to plane bottom surfaces of plates on grout beds.

D. Drill or punch holes at right angles to the surface of the metal, not more than 1/16" larger

than the connector diameter. Do not make or enlarge holes by burning. Drill material having a thickness in excess of the connector diameter and material thicker than 7/8". Holes shall be clean-cut without torn or ragged edges. Remove outside burrs resulting from drilling operations.

E. Provide holes in members to permit connection of the work of other trades. Use suitable templates for proper location of these holes. Steel requiring adjustment or accurate alignment shall be provided with slotted holes or full bearing shims as shown.

F. Provide holes, slots and openings required by other trades together with necessary reinforcing required. Use suitable templates for proper location of these openings. All such openings shall be shown on the shop drawings. No change in size or location will be permitted without prior approval.

G. Manual flame cutting shall be done only with a mechanically guided torch. An unguided torch may be used provided the cut is within 1/8" of the required line.

3.2 SHOP CONNECTIONS

A. Provide connections as shown on the drawing exactly as detailed. Where connections are not detailed, the minimum connections shall comply with appropriate tables headed, "Framed Beam Connections" shown in the AISC "Manual of Steel Construction" unless otherwise noted on the drawings. Use high strength bolts unless otherwise shown.

B. Do not use welded connections unless shown on details. Field welding is not allowed without written instruction from the Engineer of Record.

C. Proportion and detail all connections on shop drawings to resist forces shown on design drawings.

D. Bolting

1. Bolts shall be of a length that will extend not less than 1/4" beyond the nuts. Enter bolts into holes without damaging the thread.
2. Joint Type: As noted on the Structural Drawings.
3. Make high-strength bolted joints without the use of erection bolts. Bolt heads and nuts shall rest squarely against the metal. Where structural members have sloping surface, bolted connections shall be provided with beveled washers to afford square seating or framing for bolt heads or nuts.
4. All joints are to be compacted to the snug-tight condition in accordance with Section 8 of the RCSC “Specification for Structural Joints Using High-Strength Bolts.” Protect bolt heads and threads from damage during installation.
5. Pretensioned and slip-crtical joints are to be installed by one of the methods prescribed in Section 8.2 of the RCSC “Specification for Structural Joints Using

High-Strength Bolts," unless written approval is obtained from the Engineer of Record.

6. Bolts that have been completely tightened shall be marked for identification.

E. Welding

1. The following environmentally preferable welding processes shall be used as described for the related application without exception:

   a. Submerged Arc Welding (SAW): Plate girders, fillet and butt joints in pipes, cylinders, columns and beams, and welds where 'downhand' or horizontal positions are possible.
   b. Gas Metal Arc Welding (GMAW) shall be used where SAW is not applicable (such as for angled connections and anything irregular or short).
   c. Field welding shall be allowed only in special circumstances; in such cases Flux Core Arc welding (FCAW) shall be specified

2. Do not begin structural welding until joint elements are inspected for surface preparation, fit-up, and cleanliness of surface to be welded and are then bolted or tacked in intimate contact and adjusted to dimensions shown on drawings, or both, with allowance for any weld shrinkage that is expected. No members are to be spliced without prior approval by the Engineer of Record.

   a. Containment surface preparation debris must meet SSPC-Guide 6 guidelines.

3. Pre-heat and interpass temperature shall be in accordance with Table 4.2 (including footnotes) of the AWS Code for Welding in Building Construction. The temperature shall be measured from the side opposite to that which the pre-heat is applied, where possible.
4. All groove welds shall be continuous and full penetration welds unless otherwise shown on the design drawings. Welds made without the aid of a back-up bar shall have their roots chipped, ground or roughened out to sound metal from the second side, before welding is done from the second side.
5. All welds shall be sound throughout. There shall be no crack in any weld or weld pass. Weld may be considered sound if it contains only slight porosity or fusion defects which are well dispersed.
6. The heat, input, length of weld and sequence of weld shall be controlled to prevent distortions. The surfaces to be welded and the filler metals to be used shall be subject to inspection before any welding is performed.

3.3 SHOP PAINTING AND CLEANING

A. Finishing, coating, plating

1. Shop painting and factory finishing shall be preferred to field painting whenever possible. Where applicable, finishes and surface preparations based on a physical process such as abrasive blasting, grinding, buffing and polishing are preferred to coatings and solvent based cleaning. Where coatings are necessary powder-coated fabrication is preferred to painting and plating. Avoid plated metals especially those using cadmium and chromium as plate material or cyanide or copper/formaldehyde based electroless copper as the plating solution.

B. Remove all rust, scale, grease and other detrimental foreign matter in accordance with SSPC-SP 3, Power Tool Cleaning, unless conditions/opportunities listed below apply.

1. Use surface preparation classification recommended by paint manufacturer, SSPC or Master Painters Institute (MPI) for paint product used.

a. SSPC-Guide 6, Guide for Containing Debris Generated During Paint Removal Operations, must be followed for all applicable surface preparation techniques.

C. Immediately after surface preparation, apply structural steel primer paint where specified, in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 2.0 mils. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces. Use type of primer paint as specified in "Materials" article above. Apply two coats to surfaces that will be inaccessible after erection

D. Paint all structural steel in accordance with the foregoing specification, except as follows:

1. Steel which is to receive spray-on fireproofing.
2. Within 2" of field welds or welds made after paint is applied.
3. Faying surfaces in bolted connections shall be prepared per Section 3.2 of the RCSC “Specification for Structural Joints Using High-Strength Bolts.”
4. Machined surfaces and threaded parts required for adjustment of the structure. Protect these with suitable rust inhibiting coating which may be removed after final installation of the work so that proper finished coatings may be applied.

3.4 SOURCE QUALITY CONTROL

A. Refer to testing and inspection requirements specified above.

3.5 EXAMINATION

A. Verify field measurements prior to start of erection. Check the alignment and elevation

of all column supports and location of all anchor bolts with transit and level instruments before starting erection. Notify architect of any errors. Obtain Architect's approval of methods proposed for correcting errors prior to proceeding with corrections and erection.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.6 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.7 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

C. Column billets and bearing plates shall be supported and aligned on steel wedges, shims, or leveling nuts. After the supported members have been plumbed and properly positioned by instrument and anchor nuts tightened, the entire bearing area under the plate shall be packed solidly with grout specified in another Section. Wedges and shims shall be set back a minimum of 3/4" from the edges of plates and shall be left in place. Leveling plates are not permitted.

D. Plumbing, Leveling and Bracing

1. Structural steel shall be erected true and level, and temporary bracing shall be introduced wherever necessary to provide for all loads to which the structure may be subjected, including equipment and the operation thereof. Such bracing shall be left in place as long as may be required for safety. No welding shall be done or bolts drawn up tight until structural steel has been properly aligned. Obtain approval for guy locations to assure lack of interference with operations of other trades.

E. Drifting

1. Light drifting necessary to draw holes together will be permitted, but drifting of unfair holes will not be permitted. Twist drills shall be used to enlarge holes as necessary to the next larger size; use next larger size bolts as required. Reaming

that weakens the members, or make it impossible to fill the holes properly or to adjust accurately after reaming, will not be allowed.

3.8 FIELD CONNECTIONS

A. In addition to the requirements for shop connections comply with the following:

1. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
2. Joint Type: As noted on structural drawings.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

3.9 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 3, Power Tool Cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 9."

D. After erection, all damaged areas in shop coat, exposed surfaces of bolt heads, nuts and washers, and all field welds and unpainted areas adjacent to field welds and high strength bolts shall be painted with a "touch-up" application of same paint used in the shop coat and then painted with same paint used for shop coat tinted another color. Retouch in field, any scraped, abraded, and unpainted surfaces. Painting shall be as specified for shop coats.

E. Structural steel which is to support mechanical equipment and will be left exposed to the weather in the finished project shall be field painted with one coat of anti-corrosive paint as described in Part 2 for Paint Materials.

END OF SECTION

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to the work of this Section.

1.2 SUMMARY

A. Section includes but is not limited to the following as shown on the drawings and as specified herein:

1. Floor deck and roof deck
2. All necessary deck supports and reinforcing other than principal framing members including diagonals at columns, angles, plates, etc.
3. Flashing, cell closures, closure plates and sheet metal work required to contain concrete.
4. Ceiling hanger tabs at new decking composite with concrete where new suspended ceilings are required.

B. Related Requirements:

1. Concrete and reinforcement over decking
2. Structural steel
3. Shoring of metal deck where unsupported span exceeds the allowable
4. Mechanical and electrical where supported from deck
5. Fireproofing systems
6. Sheet metal work

1.3 PERFORMANCE REQUIREMENTS

A. Metal deck unit sizes and gauges are indicated on the drawings. Gauges indicated on the drawings are a minimum. Thickness of deck may be required to be increased by deck manufacturer for loadings indicated on drawings. Unit shall span over three or more supports except where steel layout does not permit.

B. Maximum allowable deflection under live load plus super imposed dead load shall not exceed (1/360) of the span or (1/4) inch whichever is less.

C. Deck shall be sized as unshored. Shoring of deck is not permitted unless specifically

shown in areas on the drawings.

D. Use of piercing, non-piercing, and integral hanger tabs is not permitted at roof deck.

E. Units included in a fire rated assembly must be classified in appropriate UL design.

1.4 SUBMITTALS

A. Product Data: Product data, including manufacturer's specifications, load tables, section properties and installation instructions for each type of decking and accessories.

B. Shop Drawings: Shop drawings for all installations showing gauges, deck layout, type of deck, any shoring required, where located, welding details necessary for fabrication to fit in place, and all accessories. Do not use reproductions of the Design Drawings. In addition, include the following:

1. Ceiling tab, fillers, closures and similar items.
2. Show placement of headed shear studs connectors with respect to the flutes of the metal deck. Variation from the specified deck configuration may result in a decrease of the capacity of the studs, requiring more studs.

C. Product Certificates: Certification of specification compliance for each item specified.

D. Reports

1. Submit certification of recycled steel content. Certification shall clearly indicate post-consumer AND post-industrial recycled steel content for the particular member or members used.
2. Submit verification of finishing process:

a. Provide a cut sheet and a Material Safety Data Sheet (MSDS) for all shop and field paints used highlighting VOC limits and chemical and mineral component limits.
b. For heavy metals in used plating processes: Provide a cut sheet and a Material Safety Data Sheet (MSDS) for each plating material and related compounds highlighting chemical component limits.
c. Certification of recycled zinc content for galvanized products: Provide cut sheets clearly indicating whether the galvanized products used meet the minimums for post-consumer OR post-industrial recycled contents. Or, if cut sheets are not available, obtain a written affidavit from the manufacturer stating the recycled content percentage and if the recycled content is post-consumer or post-industrial.

3. Submit verification of biodegradable or low VOC, and low Hazardous Air Pollutants (HAPS) cleaning solutions. Provide a cut sheet and a Material Safety Data Sheet (MSDS) for all cleaning solutions used in the surface preparation of steel

components. Highlight VOC limits and chemical component limits.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.
2. Acoustical roof deck.

F. Evaluation Reports: For steel deck.

1.5 QUALITY ASSURANCE

A. Except as modified by governing codes and by this specification, comply with the applicable provisions and recommendations of the following codes and standards:

1. American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members".
2. American Welding Society (AWS), D1.1 "Structural Welding Code" and D1.3 "Structural Welding Code-Sheet Steel".
3. Steel Deck Institute (SDI) "Design Manual for Composite Decks, Form Decks, and Roof Decks".
4. American National Standards Institute (ANSI)/Steel Deck Institute (SDI) “Quality Control and Quality Assurance for Installation of Steel Deck”.
5. ASTM Standards as applicable in the building code of the local jurisdiction and as noted in this specification.

B. Fabricator Qualifications: The work under this section shall be performed by a fabricator and erector submitting conclusive evidence of having satisfactorily completed work of similar scope and of having the necessary skill, equipment, facilities and capacities to fabricate and perform the erection in accordance with the construction schedules and in full compliance with all requirements of the Contract Documents.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work. However, efforts should be made to minimize the disturbance to site and soil conditions for example, by not requiring excessive areas to be put aside for on-site storage.

B. Store materials to permit easy access for inspection and identification. Keep all materials in a safe, dry, off ground location, using pallets, platforms, or other supports. Protect all materials from corrosion and deterioration, discoloration or staining. Make efforts to minimize any wastage and ensure that as much waste as possible is recycled.

C. Do not store materials on structure in a manner that might cause distortion or damage

to members of supporting structures. Repair or replace damaged materials or structures as directed.

1.7 PROJECT CONDITIONS

A. Examine all work prepared by others to receive work of this section and report any defects affecting installation to the contractor for correction. Commencement of work will be construed as complete acceptance of preparatory work by others.

B. If the supporting beams are not properly aligned or sufficiently level to permit proper bearing of the steel decking units, the steel decking contractor shall bring the matter to the attention of the contractor for corrective action. The steel decking units are not to be placed until the necessary correlations are made.

C. Installation of the deck and shear studs will be inspected by the Architect and/or Owner’s agent.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 MANUFACTURERS

A. Supply manufactured deck units in accordance with the applicable requirements of the Steel Deck Institute's "Design Manual for Floor Decks and Roof Decks".

B. Deck shall be manufactured by one of the following (or other equivalent as approved by the architect and engineer of record):

1. United Steel Deck (manufactured by Canam)
2. New Millennium
3. Vulcraft

2.3 DECK MATERIALS

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, with the minimum section properties indicated on the drawings. Contractor shall provide heavier

gauge if minimum gauge indicated is not adequate to support total loads as shown on the drawings.

B. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, with the minimum section properties indicated on the drawings. Contractor shall provide heavier gauge if minimum gauge indicated is not adequate to support total loads as shown on the drawings.

C. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated on the drawings. Contractor shall provide heavier gauge if the minimum gauge indicated is not sufficient to support construction loads as unshored forms and/or total load as indicated on the drawings based on the composite section. Deck shall have deformations specifically designed to produce composite action between the deck and the concrete slab by mechanical bond.

D. Non-composite Form Deck: Fabricate ribbed-steel sheet non-composite form-deck panels to comply with "SDI Specifications and Commentary for Non-composite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated on the drawings. Contractor shall provide heavier gauge if minimum gauge indicated is not adequate to support total loads as shown on the drawings.

2.4 ACCESSORIES

A. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

C. Anchor clips, vent clips, welding washers, flashing, saddle plates, sump pans, other accessories shall be those types, sizes, and configurations recommended by the decking manufacturer, and shall be of the same material and finish as the deck units. All accessories shall conform to ASTM A653/A63M.

D. Cell closure flexible strips, and fillers shall be of material in compliance with applicable building code governing class of construction.

E. Provide metal closure strips at edges of all slabs and openings that serve as pour stops for concrete. Gauge shall be sufficient to span or cantilever from steel beams.

F. Roof sump pans: Fabricate from a single piece of galvanized sheet steel of the same quality as the deck units; not less than nominal 0.0747" (14 gauge) thick before galvanizing; with bottoms level after erection and sloping sides to direct water flow to the drain,

unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1-1/2" below the roof deck surface, unless otherwise shown or required by deck configuration. Weld to deck at maximum 12" on-center.

G. Paint: Where indicated on drawings, must be compatible with galvanized surfaces such that minimal preparation is required.

1. For decks exposed to exterior conditions or high humidity paint must

a. Demonstrate corrosion resistance per standards ASTM B 117 & ASTM D 5894

2. For all decks paint must

a. Demonstrate a minimum opacity as determined by ASTM D 2805
b. Demonstrate a minimum of adhesion as classified by 4B of ASTM D 3359 method A

3. The product shall not contain any of the prohibited compounds as listed in Green Seal *Standard for Paintings and Coatings*, GS-11, latest edition and in Master Painters Institute (MPI) *Green Performance Standard*, GPS-1-08.

4. The product shall meet the VOC limits as set forth in the MPI Green Performance Standard, GPS-1-08, with a maximum allowable VOC of 340 g/L for rust preventative coatings. Limits are expressed in THINNED state. Preference shall be given to products with the least crystalline silica content.

2.5 FABRICATION

A. Fabricate deck units in accordance with the AISI's "Specification for the Design of Cold-Formed Steel Structural Members" and accepted shop drawings. Fabricate deck units to the sizes and configurations indicated and cut to lengths which will span not fewer than three supporting members; use only full length units at overhang where indicated in a manner that laps fit tightly. Locate openings for penetrations where indicated and provide support framing and edge reinforcement for all openings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSPECTION

A. Inspection of the metal deck and shear stud installation will be performed by an inspection agency retained by the owner at no expense to the contractor. The inspection agency shall work under the direction of the owner. Contractor shall provide the inspection agency with the following:

1. Schedule of all work in both shop and field with at least ten days written notice before commencement of either activity.
2. A complete set of approved shop and erection drawings.

3.3 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section. Erection shall closely follow the erection of structural steel.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members as per load schedule provided on contract documents.

D. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

E. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work, per drawings and manufacturer’s specifications.

F. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

G. Headed shear studs shall be installed by welding through metal deck onto beam below. Automatic welding machinery of approved design, amperage, duration of current, etc., shall be used. Studs shall be tested by testing laboratory in accordance with AWS Procedures for Bend Test; replace all studs which do not pass test.

H. All welding shall be performed by competent experienced welding mechanics. Welding mechanics must have AWS D1.3 certification for welding sheet metal less than 1/8 inch thick. All welds shall be given a protective coat of paint as specified in painting article of section 051200.

I. All abraded or damaged protective surfaces of steel decking work shall be touched up with a protective coat of paint by this contractor as erected.

3.4 ROOF DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members per drawings.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports per drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing per manufacturer’s specification but not less than 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

D. All unframed openings in roof deck shall be reinforced per the drawings.

E. Roof sump pans: Fabricate from a single piece of galvanized sheet steel of the same quality as the deck units; not less than nominal 0.0747" (14 gauge) thick before galvanizing; with bottoms level after erection and sloping sides to direct water flow to the drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1-1/2" below the roof deck surface, unless otherwise shown or required by deck configuration. Weld to deck at maximum 12" on-center.

F. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.5 FLOOR DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members per the drawings.Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports per the drawings.

B. End Bearing: Install deck ends over supporting frame with a minimum end bearing per manufacturer’s specification but not less than 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2” minimum or butted at Contractor's option.

C. All unframed deck openings in composite deck with concrete larger than 6" shall be reinforced per the drawings.

D. At composite deck with concrete, metal hanger tabs shall be installed at all panel sidelaps 24 inches on-center, longitudinally 24 inches on-center to create a grid nominally 24 inches by 24 inches. Tabs shall be 18 gauge minimum, capable of supporting the specified ceiling, tabs shall be a minimum of 18 gauge capable of supporting ceiling and all other suspended loads or 200 pounds, whichever is greater.

E. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

F. Sealing cellular deck openings, butt joints, and junctions with trench headers with tape is not included in this Section. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

G. The steel decking units shall be placed on the supporting steel framework and adjusted to final position before being permanently fastened. Each unit shall be brought to proper bearing on the supporting beams.

H. Deck shall, where possible, span 3 or more supports.

I. The side laps of adjacent units shall be fastened by approved method (to be shown on shop drawings) between supports at intervals as noted on the drawings.

J. All welding shall be performed by competent experienced welding mechanics. Welding mechanics must have AWS D1.3 certification for welding sheet metal less than 1/8 inch thick. All welds, shall be given a protective coat of paint as specified in painting article of Section 051200.

K. All abraded or damaged protective surfaces of steel decking work shall be touched up with a protective coat of paint by this contractor as erected.

L. Headed shear studs shall be installed by welding through metal deck onto beam below. Automatic welding machinery of approved design, amperage, duration of current, etc., shall be used. Studs shall be tested by testing laboratory in accordance with AWS Procedures for Bend Test; replace all studs which do not pass test.

M. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.6 FIELD QUALITY CONTROL

A. Special Inspection as required by the applicable Building Code of all metal decking will be performed by an inspection agency retained by the Owner at no expense to the Contractor. The inspection agency shall work under the direction of the owner. Contractor shall provide the inspection agency with the following:

1. Schedule of all work in field with at least ten days' written notice before commencement of either activity.
2. A complete set of approved shop and erection drawings.
3. Order sheets, material bills, shipping bills and mill test reports.
4. Representative sample pieces as requested by the testing agency.
5. Full and ample means and assistance for testing all material.
6. Proper facilities, including scaffolding, temporary work platforms, etc., for inspection of the work in the mills, shop and field.

B. Each person installing connections shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the inspector can refer back to the person making the connection.

C. The following minimum criteria shall be adhered to in testing of welds:

1. All welds shall be examined by visual means.
2. 25% of all welds, selected randomly, shall be measured.
3. In addition, all welds subject to tensile stress shall be examined by the Ultrasonic Method for 100% of their length.
4. 10% of all manual fillet welds shall be tested by the magnetic particle method.
5. 1'-0" at each end of automatic fillet welds shall be tested by the magnetic particle method.
6. 100% of groove welds shall be tested by the ultrasonic method.

D. Field inspection will include examination of decking for welding and touching-up of shop coat.

E. Inspection of welding will be such as to assure that the work is within the quality requirements specified below and elsewhere in this section of the specifications and will include:

1. Ascertainment that the electrodes and flux used for the SAW, GMAW and FCAW welding processes conform to the requirements of this section of the specifications.
2. Ascertainment that the approved welding procedures and sequence are followed without deviation, unless specific approval for change is obtained from the architect.
3. The testing agency shall be prepared to utilize the following approved methods of testing:

    a. Liquid penetrant inspection: ASTM E 165.
    b. Magnetic particle: ASTM A 709.
    c. Radiographic inspection: ASTM E 94 and E 1032.
    d. Ultrasonic inspection: ASTM E 114 and AWS, Chapter 6, Section C.

F. When defects are revealed, additional inspection by whatever method is deemed necessary by the inspector, shall be performed to the extent necessary to assure that the full amount of defect has been located. No further work shall be done on the assembly or sub-assembly in question until all the necessary corrections have been made. Defects

shall be repaired, using the same welding procedure that was used initially in making the weld, unless otherwise approved by the architect. Inspection of the repaired weld shall be by the same method that was used to reveal the defect. A second repair of a defective area shall not be made without approval of the Architect.

G. A distinguishing mark will be placed on all work that has been inspected and approved. Material or work that is not acceptable will be designated by words such as "REJECT" or "REPAIR" marked directly on the material or work.

H. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

I. Remove and replace work that does not comply with specified requirements.

J. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.7 CLEANING UP

A. Remove all equipment, unused materials and debris from the site immediately upon the completion of this work.

END OF SECTION

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on cold-formed steel structural members; include material descriptions and base steel thickness.

C. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, and type and location of fasteners, and accessories or items required of related work.

D. Design Data:
1. Shop drawings signed and sealed by a professional structural engineer.

E. Evaluation Service Reports: Provide reports indicating compliance with specified requirements for cold-formed steel structural members.

F. Designer's Qualification Statement.

G. Manufacturer's Qualification statement.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a professional structural engineer experienced in designing this work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Structural Framing:
1. ClarkDietrich: www.clarkdietrich.com.
2. MarinoWARE: www.marinoware.com.
3. An approved equal.
4. Substitutions: See Section 016000 - Product Requirements.

B. Connectors:
1. Same manufacturer as metal framing.

2.2 Performance Requirements

A. Comply with requirements for Contractor's design-related professional design services indicated in Section 014000 - Quality Requirements.

B. Design Requirements: Design cold-formed framing systems, components and connectors to

withstand specified design loads in compliance with applicable building code.

C. Design Criteria: In accordance with applicable codes.
1. Live load deflection meeting the following, unless otherwise indicated:
a. Exterior Walls: Maximum horizontal deflection under wind load of 1/180 of span.
b. Design nonaxial loadbearing framing to accommodate not less than 1/2 in vertical deflection.
2. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
3. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.3 MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.
1. Structural Grade: As required to meet design criteria.

2.4 STRUCTURAL FRAMING COMPONENTS

A. Wall Studs and Track Sections: AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.
1. Thickness and Depth: Depth as indicated on the drawings; thickness and structural grade as required to meet design criteria.

B. Jamb Studs: AISI S240; manufactured, engineered, c-shaped with wide flanges, designed to replace conventional double-stud framing at openings.

C. Headers: AISI S240; manufactured, engineered one-member or two-member assemblies, with wide flanges, designed to replace conventional box or nested header framing at openings.
1. Jamb Mounting Clips: Manufacturer's standard.
2. Cripple Stud Clips: Manufacturer's standard.

2.5 CONNECTIONS

A. Performance Requirements: Provide connections in compliance with requirements of AISI S240.

B. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.
1. Structural Grade: As required to meet design criteria.

C. Structural Performance: Maintain load and movement capacity required by applicable building code and specified design criteria.

D. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections at the following locations:
1. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.

2.6 Miscellaneous Connections

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot-dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Powder actuated.

2.7 SHEATHING

A. Glass-mat-faced gypsum board; ASTM C1177/C1177M, square long edges, 5/8 inch thick, Type X - fire-resistant.

2.8 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

C. Water-Resistive Barrier: See Section 072500.

PART 3 EXECUTION

3.1 Installation - General

A. Install structural members and connections in compliance with ASTM C1007.

3.2 INSTALLATION OF STUDS

A. Install wall studs plumb and level.

B. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

C. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

D. Install intermediate studs above and below openings to align with wall stud spacing.

E. Provide deflection allowance in stud track, directly below horizontal building framing at non-loadbearing framing.

F. Attach cross studs to studs for attachment of fixtures anchored to walls.

G. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

3.3 INSTALLATION OF WALL SHEATHING

A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.

1. Provide steel diagonal bracing at corners with foam insulation or gypsum board wall sheathing.
2. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges, and ends.

3.4 TOLERANCES

A. Studs - Vertical Alignment (Plumbness): 1/960 of span or 1/8 inch in 10 ft, in accordance with ASTM C1007.

B. Studs - Maximum Variation from True Position: 1/8 inch in accordance with ASTM C1007.

C. Stud Spacing: 1/8 inch from the designated spacing, provided that the cumulative error does not exceed the requirements of the finishing materials in accordance with ASTM C1007.

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated steel items.

1.2 RELATED REQUIREMENTS

A. Section 055100 - Metal Stairs.

B. Section 055133 - Metal Ladders.

C. Section 099123 - Interior Painting: Paint finish.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

D. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

E. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

F. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

H. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

I. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

K. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

L. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
      a. Include the following, as applicable:
         1) Design criteria.
         2) Engineering analysis depicting stresses and deflections.
         3) Member sizes and gauges.
         4) Details of connections.
         5) Support reactions.
         6) Bracing requirements.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.5 QUALITY ASSURANCE

A. Design structural fabricated items under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Plates: ASTM A283/A283M.

C. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

D. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities

having jurisdiction.

F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. 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.

D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FABRICATED ITEMS

A. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking and masonry; galvanized finish.

B. Lintels: As detailed; galvanized finish.

C. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.

D. Skylight Framed Opening

2.4 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Prime Painting: One coat.

D. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.5 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Obtain approval prior to site cutting or making adjustments not scheduled.

E. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 055100
METAL STAIRS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Stairs with concrete treads.

B. Structural steel stair framing and supports.

C. Handrails and guards.

1.2 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications.

B. Section 099123 - Interior Painting: Paint finish.

1.3 REFERENCE STANDARDS

A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

H. 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; 2023.

I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

K. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

M. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

N. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Design Data: As required by authorities having jurisdiction.

D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

E. Designer's Qualification Statement.

F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

1.5 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Prefabricated Metal Stairs:
   1. Lapeyre Stair, Inc: www.lapeyrestair.com.
   2. An approved equal.
   3. Substitutions: See Section 016000 - Product Requirements.

2.2 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
   2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   3. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
   4. Dimensions: As indicated on drawings.
   5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   7. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
      a. Welded Joints: Continuously welded and ground smooth and flush.
      b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
      c. Exposed Edges and Corners: Eased to small uniform radius.
      d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.3 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 1-1/2 inches, minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch minimum.
   4. Pan Anchorage to Stringers: Continuously welded, from top, to be exposed to view from bottom.
   5. Concrete Reinforcement: Welded wire mesh.
   6. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.
   1. Riser/Nosing Profile: Vertical riser with underside of nosing sloped up from bottom of tread pan at not less than 60 degrees from horizontal, with rounded top of nosing of minimum radius.

2. Nosing Depth: Not more than 1-1/2 inch overhang.
3. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: Rolled steel channels.
1. Stringer Depth: 10 inches.
2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

G. Railings: Steel pipe railings.

H. Finish: Shop- or factory-prime painted.

I. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.4 HANDRAILS AND GUARDS

A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

B. Guards:
1. Top Rails: Round pipe or tube rails unless otherwise indicated.
a. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.
2. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
a. Outside Diameter: 1 inch.
b. Material: Steel pipe or tube, round.
c. Vertical Spacing: Maximum 4 inches on center.
d. Jointing: Welded and ground smooth and flush.
3. End and Intermediate Posts: Same material and size as top rails.
a. Horizontal Spacing: As indicated on drawings.
b. Mounting: Welded to top surface of stringer.

2.5 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.

D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

E. Concrete Fill: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.

F. Concrete Reinforcement: Mesh type as detailed, galvanized.

2.6 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.

2.7 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
2. Number of Coats: One.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 055133
METAL LADDERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop-fabricated metal ladders.

1.2 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting: Paint finish.

1.3 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

D. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

E. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

F. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

H. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

I. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

K. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

L. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.5 QUALITY ASSURANCE

A. Design fabricated ladders under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Plates: ASTM A283/A283M.

C. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

D. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. 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.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related

components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FABRICATED LADDERS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 by 2 inches members spaced at 20 inches.
   2. Rungs: One inch diameter solid round bar spaced 12 inches on center.
   3. Space rungs 7 inches from wall surface.

2.4 FINISHES - STEEL

A. Prime paint steel items.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Prime Painting: One coat.

2.5 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

D. After erection, prime welds, abrasions, and surfaces not shop primed .

3.3 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 057000
DECORATIVE METAL

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes Decorative Metal as shown on drawings and schedules

B. Drawings and general provisions of the Contract Documents apply to work of this section.

1.2 SUBMITTALS

A. Shop drawings indicating quantities, dimensions, finishes, and attachment details.

B. Product literature and samples for each color, pattern, and finish as indicated.

1.3 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of 5 years experience in manufacturing decorative metals for commercial use.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site in manufacturer's original packaging, properly labeled for identification and installation purposes.

B. Store in location to avoid damage from job-site traffic, direct sunlight, moisture, stacking or other job-site contaminates. Store in a completely supported flat position. Edge storage is not recommended.

C. Handle components to avoid denting or scratching of finished surfaces.

D. DO NOT use markers on protective PVC film. Some types of ink will permeate the film and mark the material surface.

1.5 PROJECT CONDITIONS

A. Maintain a constant temperature range of 65°F to 85°F (18°C to 24°C), with stable relative humidity, for at least 48 hours prior to, throughout the installation period and maintained consistently thereafter.

B. Installation locations must be enclosed, weatherproofed and climate controlled prior to commencing installation.

C. Do not install if relative humidity is greater than 80%.

1.6 WARRANTY

A. Provide manufacturers warranty against defects in material and workmanship.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Móz Designs, Inc.

711 Kevin Court,

Oakland, CA 94621

Phone 510-632-0853

Email: estimating@mozdesigns.com

B. An approved equal

C. Substitutions: See Section 016000 - Product Requirements

2.2 METALS

A. Laser Cut Aluminum ‘Moz Metals’
1. 3/16” thick Aluminum: Type 5052 alloy complying with ASTM B209
2. Sizes: 4’x8’ standard size
3. Pattern Name
4. Powder Color Name or Collection Color Name and Grain Name
5. Finish: Polycoat Gloss (GL) or Matte (MA), or Powder coat
6. Custom Options
   a. Double Side Finish: Y/N
   b. Exterior: Y/N, submit drawings

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine product, substrates and installation conditions.

B. Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation.

C. Do not proceed with work until conditions have been corrected.

3.2 SURFACE PREPARATION

A. Prior to installation, clean surface to remove dirt, debris and loose particles. Perform additional preparation procedures as required per the manufacturer’s instructions.

B. Protection: Take all necessary precautions to prevent damage to materials during installation.

3.3 INSTALLATION

A. Install the work of this section in strict accordance with manufactures written Technical Information and workability guidelines

3.4 CLEANING

A. Remove protective coverings and clean decorative metal to remove adhesives and tape residue. Test all solvents on non-exposed surfaces prior to use.
   1.
   2. For stainless steel, use a glass cleaner and a soft cloth.
   3. For other surfaces, contact manufacturer for proper cleaning procedures.
   4. For HEAVY CLEANING and removal of grease, use oil based mineral spirits or naphtha. Low concentration ammonia based cleaning agents such as glass cleaners may also be used.
   5. Minor scuffs can be polished out by hand with a #6 to #9 type finishing polish or wax.
   6. DO NOT treat with rubbing compounds or lacquer thinner as this may dissolve or etch the coating.

B. Visually inspect all exposed surfaces for scratches or blemishes.

C. Protect Decorative Metal from damage during remainder of construction period.

END OF SECTION

SECTION 057500
DECORATIVE FORMED METAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior fabrications made of formed metal sheet, secondary supports, and anchors to structure, including:
   1. Factory fabricated column covers.

1.2 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Non-decorative metal fabrications.

B. Section 097200 - Wall Coverings: Wall covering finish to be field applied to column cover.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use; 2014 (Reapproved 2020).

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

F. NAAMM AMP 500-06 - Metal Finishes Manual; 2006.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data - Sheet Metal Material: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Specimen warranty.

C. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.

1. Show actual field measurements on shop drawings.
2. Differentiate between shop and field fabrication.
3. Indicate substrates and adjacent work with which the fabrications must be coordinated.
4. Include large-scale details of anchorages and connecting elements.

D. Verification Samples: For each finish product specified, minimum size 12 inches square, representing actual product in color and texture.

E. Installer's Qualification Statement.

F. Maintenance Data: Care of finishes and warranty requirements.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating products specified in this section.
1. With not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
1. With minimum 3 years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
1. Protect finishes by applying heavy duty removable plastic film during production.
2. Package for protection against transportation damage.
3. Provide markings to identify components consistently with drawings.
4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
1. Store in well-ventilated space out of direct sunlight.
2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
3. Store at a slope to ensure positive drainage of accumulated water.
4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.
5. Avoid contact with other materials that might cause staining, denting, or other surface damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Factory Fabricated Column Covers:
1. MOZ Designs; www.mozdesigns.com.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

2.2 FORMED METAL FABRICATIONS - GENERAL

A. Shop Assembly: Preassemble items to greatest extent possible. Minimize field splices and field assembly. Disassemble only as necessary for transportation and handling. Mark items clearly for assembly and installation.

B. Coordination: Match dimensions and attachment of formed metal items to adjacent construction. Produce integrated assemblies. Closely fit joints; align edges and flat surfaces unless indicated otherwise.

C. Forming: Profiles indicated. Maximize lengths. Fold exposed edges to form hem indicated or ease edges to radius indicated with concealed stiffener. Provide flat, flush surfaces without cracking or grain separation at bends.

D. Reinforcement: Increase metal thickness; use concealed stiffeners, backing materials or both. Provide stretcher leveled standard of flatness and stiffness required to maintain flatness and hold adjacent items in flush alignment.

E. Anchors: Straps, plates and anchors as required to support and anchor items to adjacent construction.

F. Supports: Miscellaneous framing, mounting, clips, sleeves, fasteners and accessories required for installation.

G. Welding and Brazing: Weld or braze joints continuously. Grind, fill or dress to produce smooth, flush, exposed surfaces. Do not discolor metal. Grind smooth, polish, and restore damaged finishes to required condition.

2.3 FACTORY FABRICATED COLUMN COVERS

A. Factory Fabricated Column Covers: Factory fabricated and factory finished, sheet metal column covers, mechanically fastened to structural support.
   1. Material: Aluminum sheet, ASTM B209/B209M alloy 3003 or 5005.
   2. Sheet Thickness: 090 inches, minimum.
   3. Column Section Length: 12 feet, maximum, between horizontal joints.
   4. Joint Type: Butt.
   5. Fasteners: Self-drilling; ASTM A449 heat treated steel, with manufacturer's standard corrosion resistant coating.
   6. Aluminum Finish: Manufacturer's standard anodized coating for field finished column cover as indicated on drawings.
   7. Alumium Finish: Custom, factory-printed image for column cover as indicated on drawings.

2.4 MATERIALS

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections exposed to view on finished units.

B. Fasteners, General: Same basic metal and alloy as formed metal sheet unless indicated otherwise. Do not use metals incompatible with the materials joined.

2.5 FINISHES

A. Finishes, General: Comply with NAAMM AMP 500-06.
   1. Complete mechanical finishes before fabrication. After fabrication, finish joints, bends, abrasions and surface blemishes to match sheet.
   2. Protect mechanical finishes on exposed surfaces from damage.
   3. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
   4. Appearance: Limit variations in appearance of adjacent pieces to one-half of range represented in approved samples. Noticeable variations in same piece are not acceptable. Install components within range of approved samples to minimize contrast.

B. Aluminum Finishes:
   1. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils thick.

PART 3 EXECUTION

3.1 INSTALLATION - SHEET METAL AND PLATE FABRICATIONS

A. Locate and place decorative formed sheet metal items level and plumb; align with adjacent construction. Cut, drill and fit as required to install.

B. Do not cut or abrade sheet metal finishes that cannot be completely restored in the field. Return such items to manufacturer or fabricator for required alterations and refinishing or provide new items.

C. Use concealed anchorages where possible. Provide washers where needed on bolts or screws to protect metal surfaces and make weathertight connection.

D. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers indicated.

E. Install gaskets, joint fillers, insulation, sealants, and flashings as work progresses.
   1. Make exterior decorative formed sheet metal items weatherproof.
   2. Make interior decorative formed metal items soundproof or lightproof as required.

F. Corrosion Protection: Apply permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with incompatible substrate materials. Prevent corrosion damage to material and finish.

END OF SECTION

SECTION 061053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof-mounted curbs.

B. Roofing nailers.

C. Roofing cant strips.

D. Preservative treated wood materials.

E. Fire retardant treated wood materials.

F. Communications and electrical room mounting boards.

G. Concealed wood blocking, nailers, and supports.

1.2 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2023.

D. PS 1 - Structural Plywood; 2023.

E. PS 20 - American Softwood Lumber Standard; 2021.

F. WWPA G-5 - Western Lumber Grading Rules; 2021.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Douglas Fir-Larch, unless otherwise indicated.
   2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
   4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.2 DIMENSION LUMBER

A. Grading Agency: Western Wood Products Association; WWPA G-5.

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No.2 or Standard Grade.
   2. Boards: Standard or No.3.

2.3 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1, A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

B. Other Applications:
   1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
   2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
   3. Other Locations: PS 1, C-D Plugged or better.

2.4 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.5 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category

System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
1. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature, low hygroscopic type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
   a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
   b. Provide fire-retardant treated rough carpentry items in the following locations:
      1) Within non-bearing partitions where the required fire-resistance rating of the partition is 2 hours or less.
      2) Within non-bearing exterior walls where fire resistance rating is not required.
      3) Within roof construction for girders, trusses, framing, or decking.
   c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A.
   a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
   b. Treat lumber in contact with roofing, flashing, or waterproofing.
   c. Treat lumber in contact with masonry or concrete.
   d. Treat lumber less than 18 inches above grade.
2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
   a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
   b. Treat plywood in contact with roofing, flashing, or waterproofing.
   c. Treat plywood in contact with masonry or concrete.
   d. Treat plywood less than 18 inches above grade.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately

after installation sufficient to remove indoor air contaminants.

3.2 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Provide the following specific nonstructural framing and blocking:
1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Window treatment supports.

3.3 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at roof openings except where specifically indicated otherwise. Form corners by alternating lapping side members.

3.4 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on edges and into studs in field of board.
1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.
4. Size: 48 by 96 inches, installed horizontally at ceiling height.

3.5 CLEANING

A. Waste Disposal: See Section 017419 - Construction Waste Management and Disposal.

1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.
4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 062000
FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items.

B. Exterior Soffit Board

C. Wood casings and moldings.

1.2 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting: Painting of finish carpentry items.

B. Section 099123 - Interior Painting: Painting of finish carpentry items.

C. Section 099300 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

1.3 PRICE AND PAYMENT PROCEDURES

A. See Section 012200 - Unit Prices, for additional unit price requirements.

B. Cedar Fascia Board Replacement: By the linear foot. Includes all labor, material, and equipment required to replace damaged cedar fascia board.

C. Cedar Soffit Board Replacement: By the square foot. Includes all labor, material, and equipment required to replace damaged cedar soffit board.

D. Unit Price for Cedar Fascia Board Replacement: Include the cost for Cedar Fascia Board Replacement for 100 linear feet in the base bid. State on the bid form the unit price per linear foot for cedar fascia board replacement, installed, in the event additional cedar fascia board replacement is required.

E. Unit Price for Cedar Soffit Board Replacement: Include the cost for Cedar Soffit Board Replacement for 250 square feet in the base bid. State on the bid form the unit price per square foot for cedar soffit board replacement, installed, in the event additional cedar soffit board replacement is required.

1.4 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

C. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials; 2012 (Reapproved 2020).

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

F. ICC ES ESR-4012 - ICC ES ESR-4012 Armorite Evaluation Report; 2022.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
1. Provide information as required by AWI/AWMAC/WI (AWS).

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect from moisture damage.

B. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.1 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Exterior Woodwork Items:
1. Window Casings and Moldings: Softwood; prepare for paint finish.
2. Soffits, Cedar: Prepare for staining and transparent finish.
3. Soffits, MDF: Prepare for paint finish.
4. Fascias: Cedar; prepare for staining and transparent finish.

C. Interior Woodwork Items:
1. Moldings, Bases, Casings, and Miscellaneous Trim: Cedar; prepare for staining and transparent finish.

2.2 LUMBER MATERIALS

A. Softwood Lumber: Cedar species, quarter sawn, maximum moisture content of 6 percent; with vertical grain.

2.3 SHEET MATERIALS

A. Particleboard: ANSI A208.1 Composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

2.4 Panel Core Materials

A. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
   1. Moisture Resistance Grade: MR50.
   2. Panel Thickness: as indicated on drawings.
   3. Six-Cycle Accelerated Aging: Pass, in accordance with ASTM D1037
   4. Meets or exceeds ICC ES ESR-4012
   5. Products:
      a. Roseburg Forest Products; Armorite: www.roseburg.com.
      b. An approved equal.
      c. Substitutions: See Section 016000 - Product Requirements.

2.5 FASTENINGS

A. Fasteners: Of size and type to suit application.

B. Fasteners for Exterior Applications: Stainless steel; length required to penetrate wood substrate 1-1/2 inch minimum.

2.6 ACCESSORIES

A. Lumber for Shimming and Blocking: Softwood lumber of Douglas fir species.

B. Wood Filler: Solvent base, tinted to match surface finish color.

2.7 SITE FINISHING MATERIALS

A. Stain and Varnish Materials: Comply with AWI/AWMAC/WI (AWS), unless noted otherwise.

2.8 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.2 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 099113 and 099123.

3.3 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 064100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Custom fabricated cabinet units, including base cabinets and wall cabinets.

B. Custom fabricated desks, window seats, and other specially fabricated furniture items.

C. Custom fabricated wood shelving units, and loose wood shelves.

D. Custom fabricated plastic laminate-finished wall panels as indicated on drawings.

E. Hardware.

F. Preparation for installing utilities.

1.2 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 099300 - Staining and Transparent Finishing: Field finishing of cabinet exterior and interior.

C. Section 123600 - Countertops.

1.3 REFERENCE STANDARDS

A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

B. AWI (QCP) - Quality Certification Program; Current Edition.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

D. BHMA A156.9 - Cabinet Hardware; 2020.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and

accessories.

1. Provide information as required by AWI/AWMAC/WI (AWS).
2. Include certification program label.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
2. Single Source Responsibility: Provide and install this work from single fabricator.

B. Quality Certification:

1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org.
2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
3. Provide designated labels on shop drawings as required by certification program.
4. Provide designated labels on installed products as required by certification program.
5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
6. Replace, repair, or rework all work for which certification is refused.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.8 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.1 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Cabinets:

1. Finish - Exposed Exterior Surfaces: Decorative laminate.
2. Finish - Exposed Interior Surfaces: Decorative laminate.
3. Finish - Semi-Exposed Surfaces: Decorative laminate
4. Finish - Concealed Surfaces: Manufacturer's option.
5. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
6. Door and Drawer Front Retention Profiles: Fixed panel.
7. Casework Construction Type: Type A - Frameless.
8. Interface Style for Cabinet and Door: Style 1 - Overlay; reveal overlay.
9. Grained Face Layout for Cabinet and Door Fronts: Flush panel.
10. Adjustable Shelf Loading: 50 psf.
    a. Deflection: L/144.
11. Cabinet Style: Flush overlay.
12. Cabinet Doors and Drawer Fronts: Flush style.
13. Drawer Side Construction: Multiple-dovetailed.
14. Drawer Construction Technique: Dovetail joints.

2.2 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.3 Solid Wood Lumber Materials

A. Species: Oak

B. Grade: Finish grade

C. Thickness: As indicated on drawings

D. Finish: Stain and Polyurethane, as indicated on Finish Schedule and drawings.

2.4 Panel Core Materials

A. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
   1. Grade: 115; moisture resistance: MR10.
   2. Panel Thickness: 1 inch.

2.5 LAMINATE MATERIALS

A. Manufacturers:
   1. Formica Corporation: www.formica.com/#sle.
   2. Wilsonart LLC: www.wilsonart.com.
   3. Laminart; www.laminart.com.
   4. Chemetal; www.chemetal.com.
   5. Moz; www.mozdesigns.com.
   6. Substitutions: See Section 016000 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Provide specific types as follows:
1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, color as selected, finish as indicated.
2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, color as selected, finish as indicated.
3. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, color as selected, finish as indicated.
4. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

D. Refer to Finish Schedule and Millwork drawings for manufacturer, model numbers, design numbers, locations and finish requirements.

2.6 COUNTERTOPS

A. Countertops: See Section 123600.

2.7 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized finish in concealed locations and stainless steel finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

E. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.

2.8 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated shelf rests, polished chrome finish, for nominal 1 inch spacing adjustments.

C. Countertop Support Brackets: Fixed, L-shaped, face-of-wall mounting.
1. Materials: Steel
   a. Finish: Manufacturer's standard, factory-applied, powder coat.
   b. Color: Black.
   c. Width: 1 inch.
2. Products:
   a. Rakks/Rangine Corporation; EH Series Brackets with Rounded Ends: www.rakks.com.
   b. An approved equal.
   c. Substitutions: See Section 016000 - Product Requirements.

D. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.

E. Sliding Door Pulls: Circular shape for recessed installation, steel with satin finish.

F. Keyed Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.

G. Drawer Slides:
1. Type: Full extension.
2. Static Load Capacity: Commercial grade.
3. Mounting: Side mounted.
4. Stops: Integral type.
5. Features: Provide self closing/stay closed type.
6. Manufacturers:
a. Accuride International, Inc; 3932 Medium-Duty Full Extension Slides: www.accuride.com.

H. Hinges: European style concealed self-closing type, steel with nickel-plated finish.
1. Manufacturers:
a. Blum, Inc; CLIP top BLUMOTION: www.blum.com.
b. An approved equal.
c. Substitutions: See Section 016000 - Product Requirements.

2.9 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
1. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.

F. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

3.2 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets and counter bases to floor using appropriate angles and anchorages.

3.3 ADJUSTING

A. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 070150.19
PREPARATION FOR RE-ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Replacement of existing roofing system in preparation for entire new roofing system.

B. Removal of existing flashing and counterflashings.

C. Temporary roofing protection.

1.2 RELATED REQUIREMENTS

A. Section 075419 - Polyvinyl-Chloride Roofing

B. Section 076200 - Sheet Metal Flashing and Trim: Replacement of flashing and counterflashings.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with affected mechanical and electrical work associated with roof penetrations.

B. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Attendees:
      a. Architect.
      b. Contractor.
      c. Owner.
      d. Installer.
      e. Roofing system manufacturer's field representative.
   2. Meeting Agenda: Provide agenda to participants prior to meeting in preparation for discussions on the following:
      a. Removal and installation schedule.
      b. Necessary preparatory work.
      c. Protection before, during, and after roofing system installation.
      d. Removal of existing roofing system.
      e. Installation of new roofing system.
      f. Temporary roofing and daily terminations.
      g. Transitions and connection to and with other work.

C. Schedule work to coincide with commencement of installation of new roofing system.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

1.5 FIELD CONDITIONS

A. Existing Roofing System: EPDM single-ply roofing.

B. Do not remove existing roofing membrane when weather conditions threaten the integrity of building contents or intended continued occupancy.

C. Maintain continuous temporary protection prior to and during installation of new roofing system.

D. Provide notice at least three days before starting activities that will affect normal building operations.

E. Owner will occupy building areas directly below re-roofing area.
1. Maintain access of Owner's personnel to corridors, existing walkways, and adjacent buildings.

PART 2 PRODUCTS

2.1 COMPONENTS

A. See the following sections for additional information on components relating to this work:
1. Replacement and removal of existing roofing system in preparation for entire new roofing system, see Section 075419.
2. Remove existing flashing and counterflashings in preparation for replacement of these materials as part of this work, see Section 076200 for material requirements.

2.2 MATERIALS

A. Temporary Roofing Protection Materials:
1. Contractor's responsibility to select appropriate materials for temporary protection of roofing areas as determined necessary for this work.

2.3 ACCESSORIES

A. Fasteners: Type and size as required and compatible with existing and new roofing system to resist local wind uplift.

PART 3 EXECUTION

3.1 MATERIAL REMOVAL

A. Remove only existing roofing materials that can be replaced with new materials as the weather will permit.

B. Remove metal counter flashings.

C. Remove roofing membrane, perimeter base flashings, flashings around roof protrusions, pitch pans and pockets.

D. Remove insulation and fasteners, cant strips, and blocking.

E. Repair existing concrete deck surface to provide smooth working surface for new roof system.

3.2 INSTALLATION

A. Coordinate scope of this work with requirements for installation of new roofing system, see Section 075323 for additional requirements.

3.3 PROTECTION

A. Provide temporary protective sheeting over uncovered deck surfaces.

B. Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights.

C. Provide for surface drainage from sheeting to existing drainage facilities.

D. Do not permit traffic over unprotected or repaired deck surface.

END OF SECTION

SECTION 071300
SHEET WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Underslab HDPE reinforced sheet membrane.

1.2 ABBREVIATIONS

A. HDPE - High-Density Polyethylene.

1.3 REFERENCE STANDARDS

A. ASTM C836/C836M - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; 2018 (Reapproved 2022).

B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

C. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

D. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.

E. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2017).

F. ASTM D1434 - Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting; 1982, with Editorial Revision (2015).

G. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test); 2008 (Reapproved 2023).

H. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

I. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a (Reapproved 2023).

J. ASTM D4716/D4716M - Standard Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head; 2022.

K. ASTM D5385/D5385M - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes; 2020.

L. ASTM D6574/D6574M - Standard Test Method for Determining the (In-Plane) Hydraulic Transmissivity of a Geosynthetic by Radial Flow; 2021.

M. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

N. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2019).

O. GSA-PBS 07115 - Genral Service Administration, Public Building Service: Guide Specification for Elastomeric Waterproofing; Current.

P. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for membrane.

C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.7 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water.

PART 2 PRODUCTS

2.1 SHEET WATERPROOFING APPLICATIONS

A. Underslab HDPE Reinforced Sheet Membrane:
1. Location: Elevator pit.

2.2 SHEET WATERPROOFING MATERIALS

A. Underslab HDPE Reinforced Sheet Membrane: Sheet membrane with cross-laminated, high-density HDPE backing laminated to waterproofing adhesive compound integrated into nonwoven geotextile fabric.
   1. Application: Install horizontally over prepared sub bases with concrete slab on grade.
   2. Sheet Thickness: 85 mil, 0.085 inch, minimum.
   3. Puncture Resistance: 217 lb, minimum, in accordance with ASTM E154/E154M.
   4. Tensile Strength: 80 lbs, in accordance with ASTM D4632/D4632M.
   5. Tensile Strength, Film: 4,250 psi, in accordance with ASTM D412.
   6. Hydraulic Transmissivity of a Geosynthetic using a Constant Head: No measurable flow, in accordance with ASTM D4716/D4716M.
   7. In-Plane Hydraulic Transmissivity of a Geosynthetic by Radial Flow: No water flow, in accordance with ASTM D6574/D6574M.
   8. Breaking Strength of 1" width sample Polyethylene Geomembrane Layer: 5,470 psi, in accordance with ASTM D882.
   9. Elongation - Ultimate Failure of Rubberized Asphalt Compound: > 460%, in accordance with ASTM D412.
   10. Permeance to Water Vapor Transmission: 0.01 perms, in accordance with ASTM E96/E96M Metthod B.
   11. Crack Cycling: No effect, in accordance with ASTM C836/C836M @ -15 deg. F.
   12. Peel Adhesion to Concrete: 31.3 lbs/in., in accordance with ASTM D903.
   13. Lap Peel Adhesion: 8.7 lbs/in., in accordance with ASTM D1876.
   14. Low Temperature Fexibility: No effect, in accordance with ASTM D1970/D1970M (180 degree bend over 1" mandrel at -20 degrees F)
   15. Resistance to Hydrostatic Head (minimum): 231 feet, in accordance with ASTM D5385/D5385M.
   16. Exposure to Soil Fungi: No effect, in accordance with GSA-PBS 07115 (16 weeks).
   17. Resistance to Permeance by Methane Gas: 3.48 x 10^{-7} $ft^3/(ft^2 * hr * psi)$, in accordance with ASTM D1434, tested using 99.99% purity.
   18. Water Absorption (Maximum): 0.1%, in accordance with ASTM D570.
   19. Products:
      a. Polyguard Products, Inc; Underseal Underslab Membrane: www.polyguardproducts.com.
      b. An approved equal.
      c. Substitutions: See Section 016000 - Product Requirements.

2.3 ACCESSORIES

A. Seaming Materials: As recommended by membrane manufacturer.

B. Membrane Sealant: As recommended by membrane manufacturer.

C. Bentonite Composite Waterstop: Bentonite-based waterstop with nonwoven fabric and tear-resistant netting; seals static construction joints.
   1. Standard Roll Sizes: 1/2 inch by 1 inch by 15 feet.
   2. Products:
      a. TegraSeal Products; TegraSeal WaterStop: www.tegraseal.com/#sle.

b. An approved equal.
c. Substitutions: See Section 016000 - Product Requirements.

D. Preformed Flashing Shapes: Injected or vacuum molded one piece shapes used for detailing of inside and outside corners, protrusions, and transitions.
1. Shapes: Provide 90 degree outside corner and 135 degree outside corner.
2. Color: Black.

E. Flexible Flashings: Type recommended by membrane manufacturer.

F. Adhesives: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

B. Roll out membrane, and minimize wrinkles and bubbles.

C. Overlap edges and ends, minimum 3 inches, seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.

D. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.

E. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.

F. Coordinate with drain installation; see Section 221006.

G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.

H. Seal membrane and flashings to adjoining surfaces.

I. Composite Waterstop: Install composite waterstop according to manufacturer's instructions.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mineral fiber board insulation.

B. Mineral fiber blanket insulation.

C. Concrete-faced insulated perimeter wall panels

D. Structural Insulated Sheathing (SIS)

1.2 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Metal stud walls.

B. Section 072600 - Vapor Retarder/Air Barrier: Air barrier membrane installation over blanket insulation.

C. Section 078400 - Firestopping: Smoke barrier sealant.

1.3 REFERENCE STANDARDS

A. ASTM C165 - Standard Test Method for Measuring Compressive Properties of Thermal Insulations; 2023.

B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

C. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

E. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

F. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

G. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

H. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

I. ASTM C666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and

Thawing; 1997.

J. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

K. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019 (Reapproved 2022).

L. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016 (Reapproved 2023).

M. ASTM D1761 - Standard Test Methods for Mechanical Fasteners in Wood and Wood-Based Materials; 2020.

N. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

O. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

Q. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

R. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

S. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

T. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2023a.

U. EN 15804 - Sustainability of Construction Works - Environmental Product Declarations - Core Rules for the Product Category of Construction Products; 2022 (Corrigendum 2021).

V. FM 4470 - Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction; 2016.

W. ISO 14025 - Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures; 2006.

X. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

Y. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

Z. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and accessories in insulation manufacturer’s original packaging with identification labels intact and in sizes to suit project.
   1. Ensure insulation materials are not exposed to moisture during delivery.
   2. Replace wet or damaged insulation materials.

B. Store materials off ground in dry location and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer; store in original packaging until installed.

C. Structural Insulated Sheathing shall be stored off the ground, in original shipment condition until ready for installation. Avoid continuous exposure to moisture and direct sunlight.

D. Packaging Waste Management: Remove waste packaging materials from site and dispose of packaging materials at appropriate recycling facilities. Collect and separate for disposal paper and plastic material in appropriate on-site storage containers for recycling.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Thermal Insulation:
   1. ROCKWOOL: www.rockwool.com.
   2. An approved equal.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Concrete-faced Insulated Permiter Wall Panels:
   1. TClear Corporation; WallGuard; www.tclear.com
   2. An approved equal
   3. Substitutions: See Section 016000 - Product Requirements

C. Structural Insulated Sheathing (SIS):
   1. Dupont; ArmorWall Plus Fire-Rated Structural Inulated Sheathing; www.armorwall.dupont.com.
   2. An approved equal
   3. Substitutions: See Section 016000 - Product Requirements

2.2 MINERAL FIBER BOARD INSULATION MATERIALS

A. Mineral Fiber Board Thermal Insulation: Rigid stone wool, unfaced insulation that is noncombustible, water repellent, fire resistant, and sound absorbent; Type IVB in accordance with ASTM C612.
   1. Applications: Continuous insulation for exterior metal panel systems for thermal control and fire protection.
   2. Cladding Attachment Method: Screw-through method; see manufacturer's "ROCKWOOL Cladding Attachment and Support Details" for additional information.
   3. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84 or UL 723.
   4. Smoke Developed Index (SDI): 50 or less, when tested in accordance with ASTM E84 or UL 723.
   5. Facing: Unfaced.
   6. Board Thickness: 1-1/2 inches.
   7. Board Size: 24 by 48 inches.
   8. Board Edges: Square.
   9. Thermal Resistance: R-value of 4.2 per 1 inch at 75 degrees F, minimum, when tested in accordance with ASTM C518 or ASTM C177.
   10. Density: 8 pcf, nominal.
   11. Compressive Strength: 439 psf at 10 percent compression, and 1,065 psf at 25 percent compression when tested in accordance with ASTM C165.
   12. Moisture Resistance: Absorption of less than 0.05 percent by volume.
   13. Water Vapor Permeance: 31 perm, maximum, at 1 inch thick when tested in accordance with ASTM E96/E96M, desiccant method.
   14. Metallic Corrosion Resistance: Noncorrosive/passed, when tested in accordance with ASTM C665 for steel, and ASTM C795 for stress corrosion cracking tendency of austenitic stainless steel.
   15. Melting Point: 2,150 degrees F, minimum.
   16. Fungi Resistance: Zero mold growth when tested in accordance with ASTM C1338.
   17. Environmental Product Declaration (EPD): Material included on UL-certified EPD in accordance with EN 15804 and ISO 14025; see 016000 - Product Requirements for additional information.
   18. Products:
      a. ROCKWOOL; COMFORTBOARD 80: www.rockwool.com.
      b. An approved equal.
      c. Substitutions: Not permitted.

2.3 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Mineral Fiber Blanket Thermal Insulation: Semi-rigid stone wool insulation that is noncombustible; Type 1 in accordance with ASTM C665.
   1. Applications: Insulation for steel stud exterior walls for thermal control, sound control, and fire protection.
   2. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84 or UL 723.
   3. Smoke Developed Index (SDI): 50 or less, when tested in accordance with ASTM E84 or UL 723.
   4. Facing: Unfaced.
   5. Steel Studs: See Section 054000.
      a. Blanket Overall Size: 2-1/2 inches thick by 16-1/4 inches wide by 48 inches long, nominal.
      b. Thermal Resistance: R-value of 10 at 75 degrees F, minimum, when tested in accordance with ASTM C518.
   6. Board Edges: Square.
   7. Density: Greater than 2 pcf, nominal.
   8. Moisture Resistance: Absorption of less than 0.03 percent by weight.
   9. Metallic Corrosion Resistance: Noncorrosive/passed, when tested in accordance with ASTM C665 for steel, and ASTM C795 for stress corrosion cracking tendency of austenitic stainless steel.
   10. Melting Point: 2,150 degrees F, minimum.
   11. Fungi Resistance: Zero mold growth when tested in accordance with ASTM C1338.
   12. Environmental Product Declaration (EPD): Material included on UL-certified EPD in accordance with EN 15804 and ISO 14025; see 016000 - Product Requirements for additional information.
   13. Low-Emitting VOC Material Certification: Greenguard Gold certified and listed in UL (GGG).
   14. Products:
      a. ROCKWOOL; COMFORTBATT: www.rockwool.com.
      b. An approved equal.
      c. Substitutions: See Section 016000 - Product Requirements.

B. Mineral Fiber Blanket Acoustical Insulation: Lightweight stone wool insulation that is noncombustible; Type 1 in accordance with ASTM C665, and Type 7 in accordance with ASTM C553.
   1. Applications: Insulation for steel stud interior walls for sound control and fire protection as indicated on drawings.
   2. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84 or UL 723.
   3. Smoke Developed Index (SDI): 50 or less, when tested in accordance with ASTM E84 or UL 723.
   4. Facing: Unfaced.
   5. Batt Thickness: 3 inches.
   6. Board Size: 15-1/4 by 47 inches.
   7. Noise Reduction Coefficient (NRC): Not less than 1.05 for 3 inches (76 mm) thick when measured and calculated in accordance with ASTM C423.

8. Board Edges: Square.
9. Density: Greater than 2.5 pcf, nominal.
10. Metallic Corrosion Resistance: Noncorrosive/passed, when tested in accordance with ASTM C665 for steel, and ASTM C795 for stress corrosion cracking tendency of austenitic stainless steel.
11. Melting Point: 2,150 degrees F, minimum.
12. Environmental Product Declaration (EPD): Material included on UL-certified EPD in accordance with EN 15804 and ISO 14025; see 016000 - Product Requirements for additional information.
13. Low-Emitting VOC Material Certification: Greenguard Gold certified and listed in UL (GGG).
14. Products:
    a. ROCKWOOL; AFB (Acoustical Fire Batt) Insulation: www.rockwool.com.
    b. An approved equal.
    c. Substitutions: See Section 016000 - Product Requirements.

2.4 CONCRETE-FACED INSULATED PERIMETER WALL PANELS

A. Prefinished, exterior insulating panels intended for use below and above grade applications, consisting of Type VI extruded polystyrene insulation, in accordance with ASTM C578, with a factory applied, brushed, latex-modified concrete facing.
1. Size: 24 inches by 48 inches, with tongue and groove edge on the 48 inch side
2. Thickness: 2 inches
3. Thermal Resistance: R = 10 minimum
4. Latex-modified Concrete Facing Thickness: 5/16 inch
5. Compressive Strength: 40 lbs/in^2, in accordance with ASTM D1621
6. Water Absorption: <0.1, in accordance with ASTM D2842
7. Impact Resistance: Slight indentations <0.05 inch, in accordance with FM 4470
8. Freeze/Thaw: 750 cycles, in accordance with ASTM C666
9. Permeability: 0.8, in accordance with ASTM E96/E96M

B. Accessories
1. Galvanized steel securement clips
2. Cap flashing
3. Side flashing
4. Anchors

2.5 STRUCTURAL INSULATED SHEATHING

A. An exterior wall sheathing product that provides structural sheathing, fire-resistance, air barrier, water-reistive barrier, and a high-performance continuous insulation layer; and having the following properties:
1. Air Leakage Resistance: Pass, in accordance with ASTM E2357
2. Air Infiltration at 75 Pa: 0.01 cfm/ft^2, in accordance with ASTM E283/E283M
3. Air Infiltration at 300 Pa: 0.04 cfm/ft2, in accordance with ASTM E283/E283M
4. Water Penetration at 6.27 psf: Pass, in accordance with ASTM E331
5. Mold and Mildew: Pass, in accordance with ASTM C1338
6. Fastener Sealability: Pass, in accordance with ASTM D1970/D1970M
7. Fire Resistance: Pass, in accordance with NFPA 285

8. Vapor Permeance 92 inch panel): 0.5 perms, in accordance with ASTM E96/E96M, Procedure A.
9. Flame Spread/Smoke Developed Index (face): 0/0, in accordance with ASTM E84
10. Flame Spread/Smoke Developed Index (insulation): 10/250, in accordance with ASTM E84
11. Thermal Resistance: 6.5 per inch, in accordance with ASTM C518
12. Foam Compression Range: 30 psi, in accordance with ASTM D1621
13. Fastener Withdrawal Capacity: 284 lbs, in accordance with ASTM D1761
14. Fastener Pull Through: 505.2 lbs, in accordance with ASTM D1761
15. Fastener Shear in Sheathing Only: 519 lbs, in accordance with ASTM D1761

B. Accessories
1. Seaming tape and fastener sealant as recommended by manufacturer for the conditions present.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Install insulation and structural insulated sheathing in accordance with manufacturer’s written installation instructions.

B. Ensure that insulation installation maintains continuity of thermal protection to building interior spaces.

C. Do not compress insulation to fit into spaces.

D. Coordinate installation of insulation and firestopping; see Section 078400.

E. Install insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

3.2 INSTALLATION - STRUCTURAL INSULATED SHEATHING

A. Do not use an impact drill to fasten cladding or attachments to Structural Insulated Sheathing. Fasteners shall be placed 12 inches on center in the field of the panel. Parallel seams to studs must fall on studs.

B. Structural Insulated Sheathing, once installed, may remain uncovered for a period not to exceed 180 days.

C. When installed behind open joint rainscreen systems, panel joint gaps must not exceed 3/8 inch.

D. Seal all seams and fasteners in accordance with manufacturer's instructions for continuous water-resistive barrier.

END OF SECTION

SECTION 072119
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Foamed-in-place insulation.
   1. In exterior framed walls.
   2. In underside of roofs and ceilings.

B. Protective intumescent coating.

1.2 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM C1029 - Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation; 2020.

C. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2019 (Reapproved 2022).

D. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016 (Reapproved 2023).

E. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2020.

F. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2023.

G. ASTM D2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging; 2020.

H. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

I. ASTM D6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics; 2021.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

K. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

L. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

M. FM 4880 - Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials; 2022.

N. NFPA 275 - Standard Method of Fire Tests for the Evaluation of Thermal Barriers; 2022.

O. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

P. UL 1040 - Standard for Safety Fire Test of Insulated Wall Construction; Current Edition, Including All Revisions.

Q. UL 1715 - Standard for Safety Fire Test of Interior Finish Material; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

C. Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

D. Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience, and approved by manufacturer.

1.5 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Foamed-In-Place Insulation:
1. Huntsman Building Solutions; Heatlok HFO Pro: www.huntsmanbuildingsolutions.com.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

2.2 MATERIALS

A. Foamed-In-Place Insulation: Two-component, medium-density, rigid or semi-rigid, closed cell polyurethane foam, meeting requirements of ASTM C1029 and the following ; foamed on-site, using blowing agent of water or non-ozone-depleting gas.

1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and fire protection requirements.
   a. Fire Protection: Provide 15-minute thermal barrier of 1/2 inch gypsum board or equivalent material complying with NFPA 275 test method, or foamed-in-place insulation either exposed or with covering that complies with FM 4880, NFPA 286, UL 1040, or UL 1715.
2. Core Density: 2.0-2.4 lb/ft^3, in accordance with ASTM D1622
3. Thermal Resistance: R-value of 7.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
4. Water Vapor Permeance: Vapor retarder; 1 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
5. Water Absorption: Less than 0.3 percent by volume, maximum, when tested in accordance with ASTM D2842.
6. Air Permeance: 0.02 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
7. Closed Cell Content: At least 95 percent, in accordance with ASTM D6226
8. Compressive Strength: 31 psi, in accordance with ASTM D1621
9. Tensile Strength: 44 psi, in accordance with ASTM D2126
10. Dimensional Stability: -3.7 (% volume change), in accordance with ASTM D2126
11. VOC Emissions: Meets criteria for UL Environment (Greenguard Gold)
12. Fungi Resistance: No fungal growth, in accordance with ASTM C1338
13. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
14. Thermal Barrier: Passes as an interior finish when coated with DC-315 atr 18 mils wet film thickness, 12 mils dry film thickness, in accordance with NFPA 286
15. Ignition Properties: Spontaneous Ignition Temperature: 766 degrees F, in accordance with ASTM D1929
16. Recyclable Content: 19%
17. Renewable Content: 6%
18. Basis of Design:
    a. Huntsman Building Solutions; Heatlok HFO Pro: www.huntsmanbuildingsolutions.com/#sle.
19. Other Acceptable Products:
    a. An approved equal.
20. Substitutions: See Section 016000 - Product Requirements.

2.3 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Protective Coating: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes.
1. Coating Type: Single component, water-based.
2. Protected Insulation Type: Spray polyurethane foam (SPF).
3. Application: Apply using brush, roller, or airless sprayer.
4. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
5. Color: White.
6. Products:

a. International Fireproof Technology Inc; DC315 Intumescent Coating: www.painttoprotect.com.
b. An approved equal.
c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify work within construction spaces or crevices is complete before insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.2 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.3 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Apply protective coating monolithically, without voids, to fully cover foam insulation, to achieve fire protection as required.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Field inspections and tests will be performed by an independent testing agency.

C. Inspection will include verification of insulation and protective coating thickness and density.

3.5 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 072600
VAPOR RETARDERS/AIR BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vapor retarders/air barriers.

1.2 RELATED REQUIREMENTS

A. Section 072100 - Thermal Insulation: Vapor Retarder/Air Barrier installed in conjunction with batt insulation and Structural Insulated Sheathing.

1.3 DEFINITIONS

A. Vapor Retarder/Air Barrier: Airtight barrier made of material that is relatively water vapor impermeable, to degree specified, with seams and joints sealed to adjacent surfaces.

B. Vapor Retarder Class: A measure of a material or assembly's ability to limit the amount of moisture that passes through that material or assembly. Vapor retarder class is defined using Procedure A, Desiccant Method at 73 degrees F and 50 percent Relative Humidity (RH), in accordance with ASTM E96/E96M and ICC (IBC)-2018, as follows:
   1. Class I: 0.1 perm or less.
   2. Class II: Greater than 0.1 perm to 1.0 perm.
   3. Class III: Greater than 1.0 perm to 10 perms.

1.4 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

B. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

C. ICC (IBC)-2018 - International Building Code; 2018.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

E. Installer's qualification statement.

F. Testing agency qualification statement.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.7 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Construct vapor retarder/air barrier mock-up, 15 feet long by full height, showing proposed typical installation techniques, materials, lap seams, edge sealing, sealing between dissimilar materials, and sealing around penetrations.

C. Locate where directed.

D. Mock-up may remain as part of work.

1.8 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.1 VAPOR RETARDER/AIR BARRIERS

A. Vapor Retarder/Air Barrier Sheet: Polyamide nylon sheet intended for use with unfaced, vapor-permeable insulation such as fiberglass and mineral wool in wall and ceiling cavities.
   1. Thickness: 2 mil, 0.002 inch.
   2. Water Vapor Permeance: 1.0 perm, maximum, when tested in accordance with ASTM E96/E96M using Desiccant Method.
   3. Surface Burning Characteristics: Smoke developed index of 450 or less, and flame spread index of 25 or less, Class A, when tested in accordance with ASTM E84.
   4. Seam Lap and Perimeter Adhesive: Provide manufacturer's recommended method using tape.
   5. Products:
      a. CertainTeed Corporation; MemBrain Continuous Air Barrier and Smart Vapor Retarder: www.certainteed.com.
      b. An approved equal.
      c. Substitutions: See Section 016000 - Product Requirements.

2.2 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Vapor Retarder and Adjacent Substrates: As

indicated, complying with vapor retarder manufacturer's installation instructions.

B. Vapor Retarder Tape: Coated polyester film with acrylic adhesive backing; pressure sensitive.
   1. Products: As recommended by vapor barrier manufacturer for substrate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.2 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.3 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions, using adhesive tape.

B. Vapor Retarders: Install continuous airtight barrier over surfaces indicated, with sealed seams and sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Mechanically Fastened Sheets - Vapor Retarder On Interior:
   1. When insulation is installed within assembly, install vapor retarder over insulation.
   2. Anchor to metal framing using seam tape, adhering at least one-half of tape width to metal substrate.
   3. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, providing an airtight seal.
   4. Locate laps at framing members; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet in shingle fashion to shed water.
   5. Seal entire perimeter to structure, window and door frames, and other penetrations.
   6. Where conduits, pipes, wires, ducts, outlet boxes, and other items are installed within insulation cavity, pass vapor retarder sheet behind these items and over insulation to maintain airtight seal.

E. Openings and Penetrations in Exterior Vapor Retarders:
   1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches onto vapor retarder and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
   3. At openings with nonflanged frames, seal vapor retarder to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
   4. At head of openings, install flashing under vapor retarder extending at least 2 inches beyond face of jambs; seal vapor retarder to flashing.

5. At interior face of openings, seal gaps between window/door frame and rough framing using appropriate joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of vapor retarder.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Obtain approval of installation procedures from vapor retarder/air barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

C. Owner’s Inspection: Cooperate with Owner’s inspection agency.
1. Allow access to work areas and staging.
2. Notify Owner’s inspection agency in writing of schedule for work of this section to allow sufficient time for inspection.
3. Do not perform Building Air Tightness testing or cover work of this section until inspection is complete and installation is accepted.

D. Contractor shall perform Building Air Tightness testing using the Blower Door test method following Owner's inspection.

E. Do not cover installed vapor retarders/air barriers until required testing has been completed and acceptable results have been achieved.

F. Take digital photographs of each portion of installation prior to covering up vapor retarders/air barriers.

END OF SECTION

SECTION 072701
BUILDING AIR TIGHTNESS TESTING - ACH50

THIS SECTION IS APPLICABLE TO ALL CONTRACTS. GENERAL CONSTRUCTION CONTRACT SHALL COORDINATE WITH PLUMBING CONTRACTOR, HVAC CONTRACTOR, AND ELECTRICAL CONTRACTOR.

PART 1 GENERAL

2.1 SECTION INCLUDES

A. Procedures and requirements for the preparation and testing of air barrier systems enclosure.

2.2 RELATED SECTIONS

A. Section 017000 - Execution and Closeout: Cutting and Patching

B. Section 072100 – Thermal Insulation: Continuous Air Barrier as part of Structural Insulated Sheathing

C. Section 072600 - Vapor Retarders/Air Barriers: Sheet Vapor Retarder/Air Barrier that is independent of Structural Insulated Sheathing

D. Section 079200 - Joint Sealants: Sealants used to seal air barrier(s)

E. Division 8 - Openings: Window and door assemblies that are installed in the perimeter wall and are an integral part of the air barrier system.

2.3 REFERENCES

A. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization

B. ASTM E1186 - Standard Practices for Air Leakage Site Detection in Building Enclosures and Air Barrier Systems

C. ASTM E1827 - Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door

D. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials

E. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Systems

2.4 SUBMITTALS

A. Submit under provisions of Section 013000 - Submittal Procedures.

B. Pre-Testing Checklists: Each Prime Contractor shall submit a Pre-Testing Checklist.

C. Testing agency shall submit a building specific test plan
   1. Provide a listing of all intentional openings and their required condition for testing.

2. Provide a listing of all openings required to be closed and/or sealed.
3. Indicate testing method to be used.
4. Provide a listing of the equipment to be used, including air-moving equipment, pressure gauges, air-flow and temperature measurement devices.
5. Identify hazards associated with testing, and provide description of mitigation measures to be used to safeguard property and personnel.

D. Test Reports

E. Owner's inspection agency certification of inspection and approval of installed vapor retarder/air barrier materials.

2.5 QUALITY ASSURANCE

A. Performance target: Required airtightness level for this project is 2.0 air changes per hour ACH50.

B. Installer Qualifications:
1. The contractor, or subcontractor, installing the interior airtight layer shall have experience with a minimum of at least five (5) buildings that were independently tested, by a third party, to below 2.0 ACH.

C. Mock-Up: General Construction Contractor shall provide a mock-up for evaluation of installation techniques and application workmanship.
1. Prior to installation of airtight layer, mock up airtight layer as follows to verify details and to demonstrate connections to adjoining construction elements, and other termination conditions.
2. Install mockup of airtight layer in location designated by Architect.
3. Do not proceed with remaining work until workmanship and application technique are approved by Architect.
4. Construct typical exterior wall, 10 feet wide by full floor height, illustrating materials interface and connections (tape, adhesives, gaskets), incorporating specified options including but not limited to the following:
    a. junctions of walls, foundations, ceilings, floors and roof,
    b. corner conditions
    c. window and doorframe connections

D. Cooperate and coordinate with the Owner's inspection agency. Do not cover (with drywall, blocking, mechanical equipment or other elements that would restrict access to the airtight membrane) any components of the mock up (installed airtight layer membrane or other airtight elements) until it has been inspected, blowerdoor tested and approved.

2.6 PRECONSTRUCTION MEETING

A. Preconstruction Meeting: Convene a meeting with all contractors and subcontractors affected by the Work of this Section a minimum of one week prior to commencing work of this section. Agenda shall include materials, details of construction, compatibility of materials, sequencing of construction/installation of membranes, the airtightness goal and emphasize that the success during the blowerdoor test is dependent on the collaboration of all contractors and subcontractors.

B. Coordinate Work with other prime contractors (Plumbing, Electrical, annd HVAC), operations and installation of finish materials to install correct-sized gaskets on pipes, ducts and cable when these elements pass through the interior airtight layer, and to avoid damage to installed materials. Before they commence work on site, General Construction Contract shall provide each affected trade with sufficient gaskets.

C. After meeting, post the following warning sign in a prominent location at all building entrances:

AIRTIGHT BUILDING
No drilling, airtight construction.
No cutting, airtight membranes
Report all penetrations to Superintendent and Owner'supervisor

1. 1/2 inch letter height minimum for header
2. 1/4 inch letter height for all other text

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

4.1 PRE-TESTING SCOPE REQUIREMENTS

A. All Prime Contractors shall provide temporary closure of openings, for openings that are required to be closed for testing, in accordance with testing agency specifications.

B. General Construction Contractor shall prepare existing openings for blower door testing. Follow testing agency specifications.

C. Electrical Contractor shall provide power required for testing.

D. HVAC Contractor shall close off air outlets, louvers, exhausts, etc. in accordance with testing agency specifications

E. HVAC Contractor shall temporarily shut down HVAC system.

F. General Construction Contractor shall provide all necessary equipment for testing including, but not limited to, the following: man and material lifts, labor, tarps, adhesives, tapes, gaskets, etc.

G. All Prime Contractors shall provide a Pre-Testing Checklist, identifying all measures required to be taken prior to testing, and indicating that each measure has been performed.

4.2 EXAMINATION

A. If there are unexpected pipes, ducts, or wires penetrating the airtight layer that do not have gaskets around them, notify architect and Owner's Representative of unsatisfactory preparation before proceeding.

B. Ensure that vapor retarder/air barrier is installed in strict accordance with manufacturer's instructions.

4.3 PREPARATION

A. Verify that Owner's inspection agency has inspected and approved vapor retarder/air barrier material installation.

B. Verify that intentional openings are in required condition, ready for testing.

C. Verify that exterior weather conditions are suitable for testing.

4.4 TESTING

A. Tests shall be conducted by a third party agency hired by the Owner.

B. Perform a blowerdoor test as soon as the airtight layer is completely installed. During the test search for any detectible leaks with hands, infra-red (IR) or smoke pencils.

C. Document any leaks, and repair with tapes, adhesives and accessories.

D. Repeat test, repairing as necessary, until building complies with the project airtightness goal.

E. If more than 2 holes/penetrations are made in the vapor retarder/air barrier layer following the completion of the successful blowerdoor test above, re-test and repair until building complies with the project airtightness goal.

F. For bidding purposes, allow for one initial test, and two retests.

4.5 PROTECTION

A. Protect installed products until completion of project. Repair tears or punctures immediately.

END OF SECTION

SECTION 074233
PHENOLIC WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Exterior solid phenolic cladding panel system and accessories as required for a complete drained and back-ventilated rainscreen system.
   1. Wall panels.

B. Black-out fabric.

1.2 RELATED SECTIONS

A. Section 072100 - Insulation; exterior insulation and weather barriers.

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
   2. ASTM D 635 - Standard Test Method for Small Scale Burning.
   3. ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
   4. ASTM D 1929 - Standard Test Method for Ignition Temperature.
   5. ASTM D 2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
   6. ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
   7. ASTM D 4073 - Standard Test Method for Tensile-tear Strenght of Bituminous Roofing Membranes.
   8. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   9. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials
   10. ASTM E 119 - Standard Test Method for Fire Rated or Fire Resistive Construction.
   11. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads.
   12. ASTM E 2178 - Standard Test Method for Determining Air Leakage Rate and Calcula

B. European Standards (EN):
   1. EN 438-2 - Decorative High Pressure Laminate (HPL) Sheets Based on Thermosetting Resins - Determination of Properties.
   2. EN 12524 - Building Materials and Products, Hygrothermal Properties, Tabulated Design Values.
   3. BS EN 1928 - Flexible sheets for waterproofing. Bitumen, plastic and rubber sheets for roof waterproofing. Determination of Watertightness.

C. International Organization for Standardization (ISO):

1. ISO 105 A02-93 - Tests for Color Fastness -- Part A02: Grey scale for assessing change in color.
2. ISO 178 - Determination of Flexural Properties.
3. ISO 527-3 - Determination of Tensile Properties.
4. ISO 846 - Evaluation of the Action of Organisms.

D. National Fire Protection Association (NFPA):
1. NFPA 268 - Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
2. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.4 SUBMITTALS

A. Submit under provisions of Section 0130 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Submit plan, section, elevation and perspective drawings necessary to describe and convey the layout, profiles and product components, including edge conditions, panel joints, fixture location, anchorage, accessories, finish colors, patterns and textures.

D. Code Compliance: Documents showing product compliance with local building code shall be submitted prior to the bid. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product. Alternate materials must be approved by the architect of record prior to the bid date.

E. Engineering Calculations: Submit engineering calculations as required by the local building code, showing that the installed panels and attachments system meets the wind load requirements for the project.

F. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns. Please note that samples are only representative for color and pattern and not for thickness or edge finish. Metallic colors may also show a slight fluctuation in appearance do to the metal flake orientation from batch to batch.

G. Verification Samples: For each finish product specified, two samples a minimum of 6 inches by 6 inches representing actual product, color, and patterns. Sample edges may vary from field panel edges.

H. Operation and Maintenance Data: Submit operation, maintenance, and cleaning information for products covered under this section.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary panel products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.

1. Products covered under the Work listed in this section are to be manufactured in an ISO 9001 certified facility.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer trained and approved by the manufacture or representative.

C. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

D. Mock-Up: Provide a mock-up for evaluation of the product and application workmanship.
1. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

E. Pre-installation Meetings: Conduct pre-installation conference to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
1. During transportation, use stable, flat pallets that are at least the same dimension as the sheets.
2. Materials shall be packaged to minimize or eliminate the possibility of damage during shipping. Items such as wooden side boards, wooden lid, and spacers or protective sheeting between panels shall be used to protect the panels from surface and/or edge damage.

B. Storage:
1. Store products in an enclosed area protected from direct sunlight, moisture and heat. Maintain a consistent temperature and humidity.
2. Store products in manufacturer's unopened packaging until ready for installation.
3. Stack panels using protective dividers to avoid damage to decorative surface.
4. For horizontal storage, store sheets on pallets of equal or greater size as the sheets with a protective layer between the pallet and sheet and on top of the uppermost sheet.
5. Do not store sheets, or fabricated panels vertically.

C. Handling:
1. Remove protective film within 24 hours of the panels being removed from the pallet.
2. When moving sheets, lift evenly to avoid dragging panels across each other and scratching the decorative surface.
3. Remove all labels and stickers immediately after installation.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Field Measurements: Verify actual measurements/openings by field measurements performed by the installer prior to release for fabrication. Recorded measurements to be indicated on shop drawings based on field measurements provided by the installer. Coordinate field measurements

and fabrication schedule with construction progress to avoid construction delays.

1.8 WARRANTY

A. Warranty: At project closeout, provide manufacturer's limited ten year warranty covering defects in materials. Warranty only available when material installed by an installation contractor trained and approved by the manufacturer's representative.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Trespa International B.V.; P.O. Box 110, 6000 AC Weert Wetering 20, 6002 SM Weert The Netherlands; www.trespa.com.

B. Acceptable Manufacturer's Representative: Trespa North America, Ltd.; 12267 Crosthwaite Cir., Poway, CA 92064. ASD. Toll Free
   1. Tel: (800) 4-TRESPA. Tel: (858) 679-2090. Fax: (858) 679-9568. Email: info.northamerica@trespa.com. Web: http://www.trespa.com/na.

C. Substitutions: An approved equal. Submit under the provisions of Section 016000.

2.2 WALL PANELS

A. Solid Phenolic Wall Panels: Trespa Meteon by Trespa International as represented by Trespa North America, LTD.
   1. Material: Solid panel manufactured using a combination of high pressure and temperature to create a flat panel created from thermosetting resins, homogenously reinforced with wood-based fibers and an integrated decorative surface or printed décor.
   2. Color on Primary Face: As indicated on drawings, with black reverse.
   3. Finish: Satin sheen.
   4. Panel Core: Fire retardant (FR) black core.
   5. Panel Thickness: 5/16 inch (8 mm).
   6. Physical Properties:
      a. Modulus of Elasticity: 1,300,000 psi minimum, ASTM D638-08.
      b. Tensile Strength: 10,100 psi minimum, ASTM D638-08.
      c. Flexural Strength: 14,500 psi minimum, ASTM D790-07.
      d. Density: 1.30 g/cm^2 minimuim, ASTM D792-08.
      e. Impact Resistance: Mean Failure Height = 1.0466 feet, ASTM D5420-04.
      f. Thermal Conductivity: 2.1 BTU/inch/ft2.hr.°F, EN 12524.
      g. Structural Performance (ASTM E330):
         1) Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 15 pounds per square foot (psf). Wind load testing shall be done in accordance with this standard to obtain the following results:
         2) Normal to the plane of the wall, the maximum panel deflection shall not exceed L/175
         3) Normal to the plane of the wall between supports, deflection of the aluminum sub-framing members shall not exceed L/175 or 3/4 inch,

whichever is less

a) At 1-1/2 times design pressure, permanent deflection of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion.

b) If system tests are not available, mock ups shall be constructed and tests performed under the direction of an independent third party laboratory which show compliance to the minimum standards listed above.

7. Fire Performance:
   a. Classification: Class A, ASTM E 84.
   b. Flame Spread Index: Less than 25, ASTM E84
   c. Smoke Development: Less than 450, ASTM E 84.
   d. Ignition Temperature: Greater than 650 degree F above ambient, ASTM D1929.
8. Finish Performance: Electron Beam Cure resin in conformance with the following general requirements:
   a. Color: As selected by the architect/engineer from manufacturer's full range of colors.
   b. Humidity Resistance: No formation of blisters when subjected to condensing water fog at 100% relative humidity and 100 degree F for 3000 hours, ASTM D 2247.
   c. Salt Spray Resistance: Corrosion creepage from scribe line (1/16 inch max.) and minimum blister rating of 8 within the test specimen field, ASTM B117.
   d. Weather Exposure: Accelerated - 3000 hours in Atlas Type Weatherometer using cycle of 90 minutes light and 30 minutes diminished light and demineralized water with a maximum color change of 5 Delta E units from the original color according to ASTM D-2244, with the exception of Uni-Colors A12.3.7 / A18.3.5 / A04.1.7, which will not deviate more than 10 Delta E units from original color according ASTM D-2244.
   e. Color Stability: The decorative surface comply with, classification, 4 - 5 measured with the grey scale according to ISO 105 A02-93 according to test method EN 438-2:29.
   f. Microbial Characteristics: Will not support micro-organic growth (ISO 846).

B. Mounting System:
   1. TS110 - Exposed fastening on fixed depth aluminum sub-framing.

C. Aluminum Sub Structure: Aluminum sub-structure designed to withstand structural loading due to wind load and the dead load of the panel, painted as required to conceal behind the open joinery of the attachment system.
   1. Extrusions, including corner closures, joint closures and vent screens, formed members, sheet, and plate shall conform with the recommendations of the manufacturer.

D. Extruded Aluminum Trim: Color as specified in the finish schedule.

E. Fasteners (Concealed/Exposed): Fasteners shall be non-corrosive and as recommended by panel manufacturer. Exposed fasteners shall be colored to match panels where required by the architect.

F. Panel Corner Profile:
   1. Dimensions: 143.70 inches by 11.81 inches by 11.81 inches (3650 by 300 by 300 mm) with a 5/16 inch (8 mm) thick by 3/4 inch (19 mm) radius.

2.3 BLACK-OUT FABRIC

A. UV-resistant, engineered fabric designed for use as a blackout membrane behind open-joint rainscreen claddings.
   1. Color: Black, with black imprinting
   2. Thickness: 28 mils
   3. Tensile Strength: 44 lbf/in (machine direction) in accordance with ASTM D882.
   4. Tensile Strength: 29 lbf/in (cross direction) in accordance with ASTM D882.
   5. Tear Resistance: 50 lbf/in (machine direction) in accordance with ASTM D4073/D4073M
   6. Tear Resistance: 45 lbf/in (cross direction) in accordance with ASTM D4073/D4073M
   7. UV-Resistance: No cracking visible at 20X magnification, in accordance with 2,000 h in Weatherometer
   8. Water Vapor Permeance: 55.2 perms (method A dessicant) in accordance with ASTM E96/E96M
   9. Water Resistance: Class W1, before and after aging, in accordance with BS EN 1928.
   10. Air Permeance: <0.004 cfm/ft^2 @ 1.57 psf, in accordance with ASTM E2178
   11. Surface Burning: Flame Spread 0, Smoke Generated 55, in accordance with ASTM E84
   12. Vertical and Lateral Fire Propagation: Pas

B. Manufacturers
   1. Carlisle Coatings and Waterproofing; CCW-705 RS; www.carlisleccw.com
   2. An approved equal.
   3. Substitutions - See Section 016000 - Product Requirements.

2.4 FABRICATION

A. Panels: Solid phenolic impregnated kraft paper wall panels with no voids, air spaces or foamed insulation in the core material. Accessory items in accordance with manufacturer's recommendations and approved submittals

B. Panel Weight: 8 mm (2.4 lb/ft2), 10 mm (3 lb/ ft2), 13 mm (3.8 lb/ ft2).

C. Panel Bow: = 2 mm / m (= 0.079 inch/39.38 inches).

D. Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.
   1. Appearance: Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Surfaces to receive panels shall be even, smooth, dry, and free from defects detrimental to the installation of the panel system. Notify Contractor in writing of conditions detrimental to proper

and timely completion of the work.

C. Confirm exterior sheathing is plumb and level, with no deflection greater than 1/4 inch (6 mm) in 20 feet (6096 mm).

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install solid phenolic wall panels and sub-frame system in accordance with manufacturer's instructions.

B. Install solid phenolic wall panels plumb and level and accurately spaced in accordance with manufacturer's recommendations and approved submittals and drawings.

C. Anchor panels and sub-framing securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary movement and structural support.

D. Fasten solid phenolic wall panels with fasteners approved for use with supporting substrate.

E. Do not install panels or component parts which are observed to be defective or damaged including, but not limited to: warped, bowed, abraded, scratched, and broken members.

F. Do not cut or trim component parts during installation in a manner that would damage the finish, decrease the strength, or result in visual imperfection or a failure in performance. Return component parts with require alteration to the shop for re-fabrication or replacement.

G. Install corner profiles and trim with fasteners appropriate for use with adjoining construction as indicated on the Contract Drawings and as recommended by manufacturer.

3.4 ADJUSTING AND CLEANING

A. Remove masking or panel protection as soon as possible after installation. Any masking intentionally left in place after panel installation on an elevation, shall become the responsibility of the General Contractor to remove.

B. Adjust final panel installation so that all joints are true and even throughout the installation. Panels out of plane shall be adjusted with the surrounding panels to minimize any imperfection.

C. Repair panels with minor damage. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the General Contractor.

D. Clean finished surfaces as recommended by panel manufacturer. After installation cleaning, cleaning during construction shall become the responsibility of the General Contractor.

END OF SECTION

SECTION 075300
EPDM THERMOSET SINGLE-PLY ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. EPDM thermoset single-ply roofing.

B. Membrane flashings.

C. Metal flashings.

D. Roof insulation.

1.2 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. SPRI RP-4 - Wind Design Standard for Ballasted Single-Ply Roofing Systems; 2022.

1.3 RELATED SECTIONS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 061053 - Miscellaneous Rough Carpentry.

C. Section 070150.91 - Preparation for Re-Roofing.

D. Section 072100 - Thermal Insulation.

E. Section 072119 - Foamed-In-Place Insulation

F. Section 072701 - Building Air Tightness Testing - ACH50

G. Section 076200 - Sheet Metal Flashing and Trim.

H. Section 077200 - Roof Accessories.

I. Section 086200 - Unit Skylights.

J. Section 086300 - Metal Framed Skylights.

K. Section 223000 - Plumbing Equipment.

1.4 REFERENCES

A. American Society of Civil Engineers (ASCE) - ASCE 7 - Minimum Design Loads for Buildings and Other Structures, Current Revision.

B. ANSI/SPRI RP-4 "Wind Design Standard For Ballasted Single-ply Roofing Systems".

C. ANSI/SPRI WD-1 "Wind Design Standard for Roofing Assemblies".

D. ASTM International (ASTM):
1. ASTM C 208 - Standard Specification for Cellulosic Fiber Insulating Board.
2. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
3. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
4. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
5. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
6. ASTM D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
7. ASTM D 816 - Standard Test Methods for Rubber Cements.
8. ASTM D 4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
9. ASTM D 4637 - Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane.
10. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

E. Factory Mutual (FM Global):
1. Approval Guide.
   a. Factory Mutual Standard 4470 - Approval Standard for Class 1 Roof Covers.
   b. Loss Prevention Data Sheets 1-28, 1-29.

F. International Code Council (ICC):
1. International Building Code (IBC).

G. Underwriters Laboratories (UL):
1. TGFU R1306 - "Roofing Systems and Materials Guide".
2. UL-790 - Standard Test Method for Fire Tests of Roof Coverings.

H. ANSI/ASHRAE/IESNA Standard 90.1 (2007): Energy Standard for Buildings Except Low-Rise Residential Buildings

1.5 DESIGN CRITERIA

A. Wind Uplift Performance:
1. Roof system is designed to withstand wind uplift forces as calculated using the current revision of ASCE-7.
2. Carlisle offers a standard 72 MPH wind speed warranty.

B. Fire Resistance Performance:
1. Roof system will achieve a UL Class A rating when tested in accordance with UL-790.

C. Thermal Performance: Roof system will achieve a minimum R value not less than tapered insulation.

D. Drainage: Provide a roof system with positive drainage where all standing water dissipates within 48 hours after precipitation ends.

E. Building Codes:
1. Roof system will meet the requirements of all federal, state and local code bodies having jurisdiction.

1.6 SUBMITTALS

A. Submit under provisions of Section 013000.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Detail Drawings:
1. Submit approved plan, section, elevation or isometric drawings which detail the appropriate methods for all flashing conditions found on the project.
2. Coordinate approved drawings with locations found on the Contract Drawings.

D. Selection Samples: For each finish product specified, two complete sets of chips representing manufacturer's full range of available colors, membranes, and thicknesses.

E. Verification Samples: For each finish product specified, two samples, minimum size 4 inches square representing actual product, color, and patterns.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: All products specified in this section will be supplied by a single manufacturer with a minimum of twenty (20) years' experience.

B. Installer Qualifications:
1. All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
2. Installer must be capable of extending the Manufacturer's Labor and Materials guarantee.
3. Installer must be capable of extending the Manufacturer's No Dollar Limit guarantee.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Refer to Carlisle's Roofing System specification, Part II - Application, for General Job Site Considerations.

C. Safety Data Sheets (SDS) must be on location at all times during the transportation, storage and application of materials.

D. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.

E. When loading materials onto the roof, the Carlisle Authorized Roofing Applicator must comply with the requirements of the building owner to prevent overloading and possible disturbance to the building structure.

F. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.

G. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.

H. Provide protection, such as 3/4 inch thick plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters.

I. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.

J. New roofing shall be complete and weathertight at the end of the workday.

K. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

1.10 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's Total-System warranty, outlining its terms, conditions, and exclusions from coverage.
   1. 20 years.
   2. Wind Speed Warranty- 72 mph

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Carlisle SynTec Systems, which is located at: P. O. Box 7000; Carlisle, PA 17013: ; Frank Trimboli; Tel: ; 516-253-7337; Email:frank.trimboli@coastalny.net Web: https://www.carlislesyntec.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 016000.

2.2 SCOPE / APPLICATION

A. Roof System: Provide a waterproof roof system, capable of withstanding uplift forces as specified in Design Criteria.

B. Base Flashing: Provide a waterproof, fully adhered base flashing system at all penetrations, plane transitions and terminations.

C. Insulation: Provide a roof insulation system beneath the finish membrane.

2.3 INSULATION

A. Polyisocyanurate InsulBase: Carlisle Tapered InsulBase. Rigid board with glass fiber reinforced facers (GRF) on both sides, meeting or exceeding the requirements of ASTM C 1289, Type II, Class 1.
1. Compressive Strength: Grade 2 (20 psi).
2. Density: 2 lb per cubic foot minimum.

B. SecurShield HD Polyiso Cover board: Rigid board with coated glass fiber mat facers (CGF) on both sides, meeting or exceeding the requirements of ASTM C 1289, Type II, Class 4, Grade 1.
1. Compressive Strength: 80 psi min.
2. Board Thickness: 1/2 inch.

2.4 INSULATION ADHESIVE

A. Flexible FAST Adhesive: A spray or extruded applied, two-component polyurethane, low-rise expanding foam adhesive used for attaching approved insulations to compatible substrates (concrete, cellular lightweight insulating concrete, gypsum, cementitious wood fiber, wood or steel) or existing smooth or gravel surfaced BUR, modified bitumen or cap sheets.

B. Flexible FAST Dual Cartridge Adhesive: A two-component, polyurethane construction grade, low-rise expanding adhesive designed for bonding insulation to various substrates using a portable applicator.

C. Flexible FAST Dual Tank Adhesive: A two-component, polyurethane construction grade, low-rise expanding adhesive designed for bonding insulation to various substrates using a portable applicator.

D. Flexible FAST 5 gallon Jug Adhesive: A two-component, polyurethane construction grade, low-rise expanding adhesive designed for bonding insulation to various substrates, packaged for use with spray application rigs.

2.5 ETHYLENE, PROPYLENE, DIENE TERPOLYMER (EPDM) MEMBRANE

A. Sure-Seal Non-Reinforced Membrane: Cured, non-reinforced EPDM membrane meeting the requirements of ASTM D 4637 Type I.
1. Attachment Method: Fully adhered.
2. Color: Black.
3. Membrane Thickness: 60 mil, nominal.
4. Sheet Dimensions:

a. Length: 100 feet maximum.

5. Performance:
   a. Tensile Strength: 1550 psi minimum.
   b. Tear Resistance: 200 lbf/in minimum.
   c. Elongation: 480 percent.

2.6 FLASHING ACCESSORIES

A. Sure-Seal (black)/Sure-White (white) Pressure-Sensitive Pipe Seals with Factory-Applied TAPE on the deck flange are available for use with Sure-Seal/Sure-White Roofing systems.

B. Sure-Seal/Sure-White Pressure-Sensitive Pourable Sealer Pocket: Pre-fabricated Pourable Sealer Pocket consisting of a 2 inch wide plastic support strip with Pressure-Sensitive, Factory-Applied, adhesive backed uncured Elastoform Flashing.

C. Sure-Seal/Sure-White Pressure-Sensitive (PS) Inside/Outside Corner: A 7 inch by 9 inch precut 60-mil thick Elastoform Flashing with a 30-mil Factory-Applied TAPE.

D. Sure-Seal/Sure-White Pressure-Sensitive (PS) Curb Flashing - A 60-mil thick, 20 inch wide cured EPDM membrane with 5 inch wide Factory-Applied Pressure-Sensitive TAPE along one edge to be used to flash curbs/skylights, etc.

E. Sure-Seal 20" pressure-Sensitive Cured Flashing - A 20" wide cured EPDM membrane with Pressure-Sensitive TAPE the full width, factory applied, used to flash curbs/skylights, etc.

F. Sure-Seal Pressure-Sensitive Overlayment Strip: A nominal 40-mil black, semi-cured EPDM membrane laminated to a nominal 35-mil cured, Factory-Applied TAPE for flashing gravel stops, metal edgings and Seam Fastening Plates.

G. Sure-Seal/Sure-White Pressure-Sensitive Cured Cover Strip: Sure-Seal or Sure-White 60-mil cured EPDM membrane laminated to a nominal 35-mil cured Factory-Applied TAPE.

H. Sure-Seal/Sure-White Pressure-Sensitive "T" Joint Covers: A factory cut uncured 60-mil thick EPDM flashing laminated to a nominal 35-mil Factory-Applied TAPE, used to overlay field splice intersections and to cover field splices at angle changes. Available in 6 inch by 6 inch and 12 inch by 12 inch for Sure-Seal applications, and 6 inch by 6 inch for Sure-White applications.

I. Sure-Seal/Sure-White Pressure-Sensitive Elastoform Flashing: 60-mil thick uncured EPDM Flashing laminated to a 30-mil Factory-Applied Pressure-Sensitive TAPE used in conjunction with Sure-Seal Primer.

J. Sure-Seal Pressure-Sensitive RUSS (Reinforced Universal Securement Strip):
   1. 6 inch RUSS: A nominal 6 inch wide, 45-mil thick reinforced EPDM membrane with a nominal 3 inch wide 30-mil thick cured synthetic rubber pressure-sensitive adhesive laminated to one edge. This product provides perimeter securement, and additional membrane securement at angle changes for Adhered, Ballasted, and Mechanically Fastened Roofing Systems.

2.7 CLEANERS, PRIMERS, ADHESIVES AND SEALANTS

A. Carlisle Weathered Membrane Cleaner: Clear, solvent-based cleaner used to loosen and remove contaminants from the surface of exposed EPDM membrane prior to applying EPDM Primer.

B. Sure-Seal SecurTAPE: 3 inch or 6 inch wide by 100 foot long splice tape used for splicing adjoining sections of EPDM membrane.

C. Flexible FAST Adhesive: A spray or extruded applied, two-component, polyurethane, low-rise expanding foam adhesive used to securely bond FleeceBACK membranes to a variety of substrates.

D. Sure-Seal/Sure-White One-Part Pourable Sealer: A one-component, moisture curing, elastomeric polyether sealant used as a sealant around hard-to-flash penetrations such as clusters of pipes, and is available in white or black.

E. Universal Single-Ply Sealant: A 100 percent solids, solvent free, one-part, polyether sealant that provides a weather tight sealant to a variety of building substrates; used as a termination bar sealant. Available in white only.

F. CAV-GRIP III Low-VOC Aerosol Contact Adhesive/Primer: a low-VOC, methylene chloride-free adhesive that can be used for a variety of applications including Priming unexposed asphalt prior to applying Flexible FAST Adhesive, adhering Sure-Seal EPDM, horizontally, for the field of the roof, and for adhering Sure-Seal FleeceBACK and Sure-Seal EPDM membrane to vertical walls. Coverage rate is approximately 2,000-2,500 sq. ft. per 40 lb cylinder and 4,000-5,000 sq. ft. per 85 lb cylinder as a primer, in a single-sided application and 750 sq. ft. per 40 lb cylinder and 1,500 sq. ft. per 85 lb cylinder as an adhesive for vertical walls, in a double-sided application; 1,000 sq. ft. per 40 lb cylinder and 2,000 sq. ft. per 85 lb cylinder as an adhesive, horizontally, for the field of the roof, in a double-sided application.

2.8 EDGINGS AND TERMINATIONS

A. SecurEdge 300: A 24 gauge galvanized metal water dam. Finish as noted on the Finish Schedule of the Contract Drawings.

B. SecurEdge 3000: A metal anchor bar fascia system consisting of a 20 gauge steel retainer bar, corrosion resistant fasteners and 24 gauge steel snap-on fascia cover.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Do not commence work until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment.

D. A vapor retarder / temporary roof (Carlisle VapAir Seal 725TR Air & Vapor Barrier/Temporary Roof or Carlisle VapAir Seal MD Air & Vapor Barrier) may be applied to protect the inside of the structure prior to the roof system installation.

3.3 INSULATION - SYSTEM DESIGN

A. Tapered System:
1. Reference Tapered Insulation Plan, appended to this section.
2. Field Slope: 1/8 inch per foot.
3. Sump Slope: 1/2 inch per foot.
4. Cricket Slope: 1/4 inch per foot.
5. Attachment Method: Adhesive.

3.4 INSULATION PLACEMENT

A. Install insulation or membrane underlayment in multiple layers over the substrate with boards butted tightly together with no joints or gaps greater than 1/4 inch (6 mm). Stagger joints both horizontally and vertically.

B. Secure insulation to the substrate with the required mechanical fasteners or insulation adhesive in accordance with the manufacturer's current application guidelines.

C. Do not install wet, damaged or warped insulation boards.

D. Stagger joints in one direction unless joints are to be taped. Install insulation boards snug. Gaps between board joints shall not exceed 1/4 inch. Fill all gaps in excess of 1/4 inch with same insulation material.

E. Wood nailers must be at least 3 1/2 inches wide or 1 inch wider than adjacent metal flange. Thickness must equal that of insulation but not less than 1 inch thickness.

F. Miter and fill the edges of the insulation boards at ridges, valleys and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.

G. Do not install any more insulation than will be completely waterproofed each day.

3.5 INSULATION ATTACHMENT

A. Securely attach insulation to the roof deck for Adhered Roofing Systems. Attachment must have been successfully tested to meet or exceed the calculated uplift pressure required by the International Building Code (ASCE-7) or ANSI/SPRI WD-1.

B. Enhance the perimeter and corner areas in accordance with the International Building Code (ASCE-7) or ANSI/SPRI WD-1.

C. Install insulation layers, maximum 4 feet by 4 feet, applied with adhesive, coverage rate as necessary to achieve the specified attachment and uplift rating. Press each board firmly into place after adhesive develops strings when touched, typically 1-1/2 to 2 minutes after adhesive was applied, and roll with a weighted roller. Add temporary weight and use relief cuts to ensure boards are well adhered. Stagger the joints of additional layers by a minimum of 6 inches.

3.6 MEMBRANE PLACEMENT AND ATTACHMENT (Fully Adhered)

A. Unroll and position membrane without stretching. Allow the membrane to relax for approximately 1/2 hour before bonding. Fold the sheet back onto itself so half the underside of the membrane is exposed.

B. Apply the Bonding Adhesive in accordance with the manufacturer's published instructions, to both the underside of the membrane and the substrate. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.

C. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded half of the membrane sheet with a soft bristle push broom to achieve maximum contact.

D. Fold back the unbonded half of the membrane sheet and repeat the bonding procedure.

E. Install adjoining membrane sheets in the same manner, overlapping edges appropriately to provide for the minimum splice width. It is recommended that all splices be shingled to avoid bucking of water.

3.7 MEMBRANE SPLICING (Adhesive Splice)

A. Fold the top sheet back and clean the dry splice area (minimum 3 inches wide) of both membrane sheets by scrubbing with clean natural fiber rags saturated with Splice Cleaner or HP-250 Primer. When using Sure-Seal (black) PRE-KLEENED membrane, cleaning the splice area is not required unless contaminated with field dirt or another residue.

B. Apply Splicing Cement in accordance with the manufacturer's current application guidelines, and roll the top sheet onto the mating surface.

C. Roll the splice with a 2 inch wide steel roller and wait at least 2 hours before applying Lap Sealant to the splice edge following the manufacturer's requirements.

D. Field splices without In-Seam Sealant must be overlaid with uncured flashing.

3.8 MEMBRANE SPLICING (Tape Splice)

A. Overlap adjacent sheets and mark a line 1/2 inch out from the top sheet.

B. Fold the top sheet back and clean the dry splice area (minimum 2 1/2 inches of both membrane sheets with Sure-Seal Primer as required by the membrane manufacturer.

C. Where Splice Tape is not Factory-Applied, apply Splice Tape to bottom sheet with the edge of the release film along the marked line. Press tape onto the sheet using hand pressure. Overlap tape roll ends a minimum of 1 inch.

D. Remove the release film and press the top sheet onto the tape using hand pressure.

E. Roll the seam toward the splice edge with a 2 inch wide steel roller.

F. Install Pressure-Sensitive "T" Joint Cover, a 6 inch wide section of Pressure-Sensitive Elastoform Flashing over all field splice intersections.

G. When using non-Pressure-Sensitive Elastoform Flashing or Elastoform Flashing, seal edges of flashing with Lap Sealant.

H. The use of Lap Sealant with tape splices is optional except at tape overlaps and cut edges of reinforced membrane where Lap Sealant is required.

3.9 FLASHING

A. Wall and curb flashing shall be cured EPDM membrane. Continue the deck membrane as wall flashing where practicable.

B. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

3.10 WALKWAYS

A. Install walkways at all traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and all locations as identified on the Contract Drawings.

B. Adhere walkways pads to the EPDM membrane in accordance with the manufacturer's current application guidelines.

3.11 DAILY SEALS

A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the workday, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.

B. Use Sure-Seal Pourable Sealer or other acceptable membrane seal in accordance with the manufacturer's requirements.

3.12 CLEAN UP

A. Perform daily clean-up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.

B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

3.13 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and counterflashings.

B. Sealants for joints within sheet metal fabrications.

1.2 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with ten years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sheet Metal Flashing and Trim:
   1. ALUCOBOND USA: www.alucobondusa.com.
   2. Petersen Aluminum Corporation: www.pac-clad.com.
   3. An approved equal
   4. Substitutions: See Section 016000 - Product Requirements.

2.2 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal, shop pre-coated with PVDF coating.
   1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's full colors.

2.3 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing _____. Return and brake edges.

2.4 ACCESSORIES

A. Fasteners: Same material and finish as flashing metal.

B. Primer Type: Zinc chromate.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.4 SCHEDULE

A. Counterflashings at Roofing Terminations (over roofing base flashings):

B. Counterflashings at Curb-Mounted Roof Items, including skylights and roof hatches:

END OF SECTION

SECTION 077123
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pre-finished galvanized steel gutters and downspouts.

B. Copper downspouts.

1.2 RELATED REQUIREMENTS

A. Section 076200 - Sheet Metal Flashing and Trim: Miscellaneous sheet metal fabrications required for complete installation.

B. Section 221413: Connection of downspouts to storm sewer.

1.3 REFERENCE STANDARDS

A. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM B32 - Standard Specification for Solder Metal; 2020.

D. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 10 years.

B. Comply with applicable code for size and method of rain water discharge.

C. Maintain one copy of document on site.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on prefabricated components.

C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

D. Samples: Submit two samples, 18 inch long illustrating component design, finish, color, and configuration.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Gutters and Downspouts:
1. K & M Sheet Metal; www.kmsheetmetal.com.
2. An approved equal
3. Substitutions: See Section 016000 - Product Requirements.

2.2 MATERIALS

A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.
1. Finish: Shop pre-coated with PVDF (polyvinylidene fluoride) coating.
2. Color: As selected by Architect from manufacturer's standard colors.

B. Copper: ASTM B370, cold rolled 0.22 inch thick; natural finish.

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Solder: ASTM B32; Sn50 (50/50) type.

2.3 COMPONENTS

A. Gutters: Profile as indicated.

B. Downspouts: SMACNA rectangular profile.

C. Conductor Heads, Connectors, and Adapters: Furnish required conductor heads, connectors, and adapter pieces for a complete, functional drainage system.

D. Anchors and Supports: Profiled to suit gutters and downspouts.
1. Gutter Supports: Brackets.
2. Downspout Supports: Straps.

E. Fasteners: Galvanized steel, with soft neoprene washers.

2.4 FABRICATION

A. Form gutters and downspouts of profiles and sizes indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion

or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Tin edges of copper sheet to be soldered. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.

F. Fabricate gutter and downspout accessories; seal watertight.

2.5 FINISHES

A. Fluoropolymer Coating: Superior Performance Organic Finish, AAMA 2605, multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.6 ACCESSORIES

A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
1. Configuration: Angular.
2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
3. Finish: Manufacturer's standard factory applied powder coat finish.
4. Color: To be selected by Architect from manufacturer's standard range.
5. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, and rubber coupling.
6. Products:
a. Jay R. Smith Mfg. Co.; 1785/1786 Series Downspout Boots; www.jrsmith.com.
b. An approved equal.
c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

3.2 PREPARATION

A. Paint concealed sheet metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.3 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

C. Slope gutters 1/8 inch per foot .

D. Solder copper metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

E. Connect downspouts to downspout boots at 18 inches above grade. Seal connection watertight.

END OF SECTION

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof curbs.

B. Equipment rails.

C. Roof hatches, manual and automatic operation, including smoke vents.

D. Eave vents.

E. Strip vents.

1.2 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.1 ROOF CURBS

A. Roof Curbs Mounting Assemblies: Factory fabricated sheet metal construction, internally reinforced, insulated (where indicated on drawings), and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Applications: Roof curbs used for skylights and HVAC units.
   2. Roof Curb Mounting Substrate: Curb substrate consists of corrugated metal roof deck with insulation.
   3. Sheet Metal Material:

a. Aluminum: 0.080 inch minimum thickness, with 3003 alloy, and H14 temper.
1) Color: As selected by Architect from manufacturer's standard line of colors.

4. Fabricate curb bottom and mounting flanges for installation directly on currogated metal roof deck.
5. Provide layouts and configurations indicated on drawings.

B. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
1. Provide preservative treated wood nailers along top of curb.
2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
3. Height Above Finished Roof Surface: 8 inches, minimum.

C. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
1. Provide preservative treated wood nailers along top of rails.
2. Height Above Finished Roof Surface: 8 inches, minimum.

2.2 ROOF HATCHES AND VENTS

A. Eave Vents: Factory fabricated, formed panels with integral attachment flanges and snap-on cover.
1. Vent Material: 0.014-inch thick aluminum.
2. Finish: Manufacturer's standard.
3. Finish Color: To be selected by Architect from manufacturer's standard range.
4. Products:
a. Air Vent Inc.; Model SV201; www.airvent.com.
b. An approved equal
c. Substitutions: See Section 016000 - Product Requirements.

B. Strip Vents:
1. Vent Material: 1 inch x 1-1/2 inch heat-resistant polypropylene
2. Finish Color: To be selected by Architect from manufacturer's standard range.
3. Products:
a. Coravent Incorporated
b. An approved equal
c. Substitutions: See Section 016000-Product Requirements

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

END OF SECTION

SECTION 078123
INTUMESCENT FIRE PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Intumescent fire-resistive coatings applied to primary and secondary structural steel members to provide specified fire resistance rating.

B. Protective and/or decorative topcoats.

1.2 RELATED REQUIREMENTS

A. Section 014000 - Quality Assurance

B. Section 051200 - Structural Steel Framing

C. Section 078400 - Firestopping

D. Section 092116 - Gypsum Board Assemblies

E. Section 099123 - Interior Painting: Field-applied paints for top coat finish.

1.3 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

E. SSPC-PA 2 - Procedure for Determining Conformance to Dry Coating Thickness Requirements; 2022.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Performance characteristics and test results.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Certificates: Certify that intumescent fireproofing provided for this project meets or exceeds specified requirements in all respects.

D. Test Reports: Published fire resistive designs for structural elements of the types required for the project, indicating hourly ratings of each assembly.

E. Field Quality Control Submittals: Submit field test report.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company that specializes in manufacturing the type of products specified, with minimum of ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver materials in manufacturer’s original, unopened containers with identification labels and testing agency markings intact and legible.

C. Store products in manufacturer's unopened packaging until ready for installation.
1. Store at temperatures not less than 50 degrees F in dry, protected area.
2. Protect from freezing, and do not store in direct sunlight.
3. Dispose of any materials that have come into contact with contaminants of any kind prior to application.

D. Dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 FIELD CONDITIONS

A. Protect areas of application from windblown dust and rain.

B. Maintain ambient field conditions, such as temperature, humidity, and ventilation, within limits recommended by manufacturer for optimum results. Do not install products under ambient conditions outside manufacturer's absolute limits.
1. Provide temporary enclosures as required to control ambient conditions.
2. Do not apply intumescent fireproofing when ambient temperatures are below 50 degrees F without specific approval from manufacturer.
3. Ensure that relative humidity is between 40 and 60 percent in areas of application.
4. Provide ventilation in enclosed spaces during application and for not less than 72 hours afterward.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Intumescent Thin-Film Fire Protection for Metal:
   1. Hilti, Inc; Fire Finish Steel Protection Spray CFP-SP WB: www.hilti.com.
   2. An approved equal.
   3. Substitutions: See Section 016000 - Product Requirements.

2.2 SYSTEM REQUIREMENTS

A. Fireproofing: Provide intumescent thin-film fire protection systems tested by an independent testing agency in accordance with ASTM E119 and acceptable to authorities having jurisdiction (AHJ).

2.3 MATERIALS

A. Fire Resistive Coating System: Thin-film intumescent fire protection system for structural steel.
   1. Surface Burning Characteristics: Class A, flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   2. For Interior Use:
      a. Use only water-based products.
      b. Use only products without fiber content.
      c. VOC Content: 0 g per L when tested in accordance with 40 CFR 59, Subpart D (EPA Method 24).
      d. Direct Impact Resistance: 90 in-lb.
      e. Solids by Volume: 60%, +/-3%
      f. Solids by Weight: 70%, +/-3%
      g. Abrasion Resistance: 0.005 ounce/1000 cycles, maximum.
      h. Bond Strength: 500 psi, minimum.
      i. Durometer Hardness, Type D: 65, minimum, in accordance with ASTM D2240.
      j. Basis of Design: Hilti, Inc; Fire Finish Steel Protection Spray CFP-SP WB: www.hilti.com/#sle.
      k. Substitutions: See Section 016000 - Product Requirements.

B. Decorative Top Coating: As recommended by fireproofing manufacturer for exposure and substrate conditions. Refer to Section 099123 - Interior Painting
   1. Color and Gloss: As indicated on drawings.

C. Sealers and Primer: As required by tested and listed assemblies, and recommended by fireproofing manufacturer to suit specific substrate conditions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates to determine if they are in satisfactory condition to receive intumescent fire

protection; verify that substrates are clean and free of oil, grease, incompatible primers, or other foreign substances capable of impairing bond to fireproofing system.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Thoroughly clean surfaces to receive fireproofing.

B. Repair substrates to remove surface imperfections that could effect uniformity of texture and thickness of fireproofing system, and remove minor projections and fill voids that could telegraph through finished work.

C. Cover or otherwise protect other work that might be damaged by fallout or overspray of fireproofing system, and provide temporary enclosures as necessary to confine operations and maintain required ambient field conditions.

3.3 APPLICATION

A. Comply with manufacturer's instructions for each particular intumescent fire protection system installation application as indicated.

B. Apply manufacturer’s recommended primer to required coating thickness.

C. Apply fireproofing to full thickness over entire area of each substrate to be protected.

D. Apply coats at manufacturer’s recommended rate to achieve dry film thickness (DFT) as required for fire resistance ratings designated for each condition.

E. Apply intumescent fire protection by spraying to maximum extent possible, and as necessary complete coverage by roller application or other method acceptable to manufacturer.

3.4 FIELD QUALITY CONTROL

A. Perform field testing in accordance with Section 014000 - Quality Requirements.
   1. Arrange for testing of installed intumescent fire protection by an independent testing laboratory using magnetic pull-off dry film thickness gauge in accordance with SSPC-PA 2, and ensure it meets requirements of authorities having jurisdiction (AHJ).
   2. Submit field test reports promptly to Contractor and Architect.

B. Repair or replace intumescent fire protection at locations where test results indicate fireproofing does not meet specified requirements.

3.5 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Immediately after installation of fireproofing in each area, remove overspray and fallout from other surfaces and clean soiled areas.

3.6 PROTECTION

A. Protect installed intumescent fire protection from damage due to subsequent construction activities, so fireproofing is without damage or deterioration before Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 078400
FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Firestopping systems.

1.2 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

C. ITS (DIR) - Directory of Listed Products; Current Edition.

D. FM (AG) - FM Approval Guide; Current Edition.

E. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

F. UL (DIR) - Online Certifications Directory; Current Edition.

G. UL (FRD) - Fire Resistance Directory; Current Edition.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

1.4 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:

1. Verification of minimum three years documented experience installing work of this type.
2. Verification of at least five satisfactorily completed projects of comparable size and type.

PART 2 PRODUCTS

2.1 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

C. Fire Ratings: Refer to drawings for required systems and ratings.

2.2 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.3 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

2.4 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

2.5 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.3 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

3.4 CLEANING

A. Clean adjacent surfaces of firestopping materials.

END OF SECTION

SECTION 079100
PREFORMED JOINT SEALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preformed strip seals.

1.2 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's technical data sheets for each product, including chemical composition, movement capability, color availability, limitations on application, and installation instructions.

C. Manufacturer's Qualification Statement.

D. Installer's Qualification Statement.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section with at least three years of documented experience.

1.4 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a two year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealers that fail to achieve watertight seal or exhibit loss of adhesion or cohesion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Preformed Strip Seals:
   1. EMSEAL Joint Systems, Ltd; Horizontal Colorseal: www.emseal.com.
   2. An approved equal.
   3. Substitutions: See Section 016000 - Product Requirements.

2.2 PREFORMED STRIP SEALS

A. Preformed Strip Seal: Factory formed profile for adhered application to face of joint substrate.
   1. Measure size of existing joints before selecting seal width.
   2. Provide compatible materials for application as recommended by manufacturer.
   3. Applications:
      a. Concrete floor slab joints.

2.3 ACCESSORIES

A. Adhesive: As recommended by seal manufacturer.

B. Substrate Cleaner: Non-corrosive, non-staining type recommended by seal manufacturer; compatible with joint forming materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive this work.

B. Measure joint dimensions and verify that seal products are of the correct size to properly seal the joints.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Preformed Strip Seals:
   1. Install when ambient temperature is within recommended application temperature range of adhesive, and consult with manufacturer before installing outside this temperature range.
   2. Prepare joints and install seals in accordance with manufacturer's written recommendations.
   3. Remove loose materials and foreign matter that could impair adhesion.
   4. When installing over existing non-functioning sealant, remove portions of existing installation that protrude beyond surface; install backing tape on surface of existing sealant installation to prevent adhesion of strip seal.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.2 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

F. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

G. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Nonsag Sealants:
   1. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com.
   2. An approved equal.
   3. Substitutions: See Section 016000 - Product Requirements.

2.2 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Do Not Seal:
      a. Intentional weep holes in masonry.
      b. Joints indicated to be covered with expansion joint cover assemblies.
      c. Joints where sealant is specified to be furnished and installed by manufacturer of

product to be sealed.

d. Joints where sealant installation is specified in other sections.

e. Joints between suspended ceilings and walls.

B. Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.

C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.

1. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

D. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.3 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

B. Colors: As indicated on drawings.

2.4 NONSAG JOINT SEALANTS

A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus ____ percent, minimum.
2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.

B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 50 percent, minimum.
2. Color: Match adjacent finished surfaces.

C. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.

1. Color: Standard colors matching finished surfaces, Type OP (opaque).

2.5 ACCESSORIES

A. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.2 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.3 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Thermally insulated hollow metal doors with frames.

D. Hollow metal borrowed lites glazing frames.

1.2 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

B. Section 088000 - Glazing: Glass for doors and borrowed lites.

1.3 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2020.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

H. 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; 2023.

I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

J. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

L. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

P. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

Q. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

R. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Maintain at project site copies of reference standards relating to installation of products specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hollow Metal Doors and Frames:
1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.
6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.3 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 3 - Extra Heavy-duty.
    b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 1 - Full Flush.
d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.

2. Door Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
   a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
3. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane.
4. Door Thickness: 1-3/4 inches, nominal.
5. Weatherstripping: Refer to Section 087100.

C. Interior Doors, Non-Fire-Rated:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
   a. Level 3 - Extra Heavy-duty.
   b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
   c. Model 1 - Full Flush.
   d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inches, nominal.

2.4 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Frame Finish: Factory primed and field finished.

C. Exterior Door Frames: Full profile/continuously welded type.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
3. Thermal Break: Thermally-broken frame.
4. Weatherstripping: Separate, see Section 087100.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.

E. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

F. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

G. Transom Bars: Fixed, of profile same as jamb and head.

H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

I. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

2.5 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 ACCESSORIES

A. Glazing: As specified in Section 088000, factory installed.

B. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

C. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.1 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.2 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Install door hardware as specified in Section 087100.
   1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

3.3 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.5 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; non-rated and acoustical.

B. Transom panels.

1.2 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 087100 - Door Hardware.

1.3 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

C. ASTM E413 - Classification for Rating Sound Insulation; 2022.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
   1. Provide information as required by AWI/AWMAC/WI (AWS).

D. Samples: Submit two samples of door veneer, 12 by 12 inches in size illustrating wood grain, stain color, and sheen.

E. Test Reports: Show compliance with specified requirements for the following:
   1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wood Veneer Faced Doors:
1. VT Industries, Inc; Heritage Collection: www.vtindustries.com.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

2.2 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.
1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
1. Provide solid core doors at each location.
2. Sound-Rated Doors: Minimum STC as indicated on drawings, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.

C. Transom Panels: Same construction and finish as door; same performance rating as door.

2.3 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

B. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.4 DOOR FACINGS

A. Veneer Facing for Transparent Finish: TBD, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
1. Vertical Edges: Same species as face veneer.
2. Transoms: Continuous match to doors.

B. Facing Adhesive: Type II - water resistant.

2.5 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

F. Provide edge clearances in accordance with the quality standard specified.

2.6 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 9, UV Curable, Acrylated Epoxy, Polyester or Urethane.
      b. Sheen: Flat.

2.7 ACCESSORIES

A. Hollow Metal Door Frames: See Section 081113.

B. Glazed Openings:
   1. Laminated Safety Glass: Comply with 16 CFR 1201 test requirements for Category II.
   2. Glazing: Single vision units, 1/4 inch thick glass.
   3. Tint: Clear.

C. Door Window Frames: Door window frames with glazing securely fastened within door opening.
   1. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.
   2. Metal Finish: Beige polyester powder coating.
   3. Glazing: 1/4 inch thick, laminated safety glass, in compliance with requirements of authorities having jurisdiction.

D. Door Hardware: See Section 087100.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.3 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 083100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.2 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Field paint finish.

1.3 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; Current Edition.

B. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

F. Project Record Documents: Record actual locations of each access unit.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Location: As indicated on drawings.
   2. Panel Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.

3. Size: 12 by 12 inches.
4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Fire-Rated Wall-Mounted Units:
1. Location: As indicated on drawings.
2. Wall Fire-Rating: As indicated on drawings.
3. Panel Material: Steel.
4. Size: 12 by 12 inches.
5. Door/Panel: Uninsulated single-surface panel, with tool-operated spring or cam lock and no handle.

C. Ceiling-Mounted Units:
1. Location: As indicated on drawings.
2. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
4. Size - Other Ceilings: 12 by 12 inches.
5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

D. Fire-Rated Ceiling-Mounted Units:
1. Location: As indicated on drawings.
2. Ceiling Fire-Rating: As indicated on drawings.
3. Panel Material: Steel.
4. Size: 12 by 12 inches.
5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.2 Wall- and Ceiling-MOUNTED ACCESS UNITS

A. Manufacturers:
1. ACUDOR Products Inc: www.acudor.com.
a. Airtight, Watertight, Wall and Ceiling Mounted Units: ACUDOR ADWT.
b. Fire-Rated Ceiling-Mounted Units - 2 Hours or Less: ACUDOR FWC-5015.
c. Fire-Rated Wall-Mounted Units - 2 Hours or Less: ACUDOR FW-5015.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
1. Style: Exposed frame with door surface flush with frame surface.
a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
2. Door Style: Single thickness with rolled or turned in edges.
3. Heavy-Duty Frames: 14-gauge, 0.0747-inch minimum thickness.
4. Heavy-Duty Single Steel Sheet Door Panels: 14-gauge, 0.0747-inch minimum thickness.
5. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
b. Provide certificate of compliance from authorities having jurisdiction indicating

approval of fire rated doors.

6. Steel Finish: Primed.
7. Primed and Factory Finish: Polyester powder coat; color as scheduled.
8. Door/Panel Size: As scheduled.
9. Hardware:
   a. Hardware for Fire-Rated Units: As required for listing.
   b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
   c. Latch/Lock: Tamperproof tool-operated cam latch.
   d. Gasketing: Extruded neoprene, around perimeter of door panel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.2 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 084229
AUTOMATIC ENTRANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sliding type packaged power-operated door assemblies.

B. Controllers, actuators and safety devices.

1.2 RELATED REQUIREMENTS

A. Section 084413 - Glazed Aluminum Curtain Walls: System in which packaged power-operated door assemlies are installed.

B. Section 088000 - Glazing

1.3 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

C. BHMA A156.10 - Power Operated Pedestrian Doors; 2017.

D. ITS (DIR) - Directory of Listed Products; Current Edition.

E. {RSTEMP#1870}NFPA 70 - National Electrical Code; National Fire Protection Association{CH#52238}.

F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL (DIR) - Online Certifications Directory; Current Edition.

H. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings:
   1. Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, electrical characteristics and connection requirements.

C. Product Data: Include system components, sizes, features, and finishes.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

F. Maintenance Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.

G. Executed warranty.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. Wrenches and other tools required for maintenance of equipment.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience, and a member of AAADM.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience and approved by manufacturer.
1. Certified by AAADM.

1.6 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for labor and material. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sliding Automatic Entrance Door Assemblies:
1. Stanley Access Technologies; Dura-Glide 3000 Sliding: www.stanleyaccess.com.
2. Assa Abloy Entrance Systems; SL500 Pocket Package Overhead Concealed Full Breakout Narrow Stile Bi-Part Sliding Door System; www.specdesk.na.besam@assaabloy.com
3. An approved equal.
4. Substitutions: See Section 016000 - Product Requirements.

2.2 POWER OPERATED DOORS

A. Power Operated Doors: Provide products that comply with NFPA 101 and requirements of authorities having jurisdiction; provide equipment selected for actual door weight and for light pedestrian traffic, unless otherwise indicated.
1. Packaged Door Assemblies: Provide components by single manufacturer, factory-assembled, including doors, frames, operators, actuators, and safeties.
2. Air Leakage: Maximum of 1.0 cfm/sf of wall area, when tested in accordance with

ASTM E283/E283M at 1.57 psf pressure differential across assembly.

3. Exterior and Vestibule Doors: Provide equipment suitable for operating temperature range of minus 20 to plus 140 degrees F ambient.

B. Sliding and Folding Doors with Full Power Operators: Comply with BHMA A156.10; safeties required; provide break-away operation unless otherwise indicated; in the event of break-away operation, interrupt power operation.
   1. Comply with UL 325; acceptable evidence of compliance includes UL (DIR) or ITS (DIR) listing or test report by testing agency acceptable to authorities having jurisdiction.
   2. Force Required to Swing Break-Away Panel: 50 pound-force, maximum, measured at 1 inch from the latch edge of the door at any point in the closing cycle.

C. Operators:
   1. Electric Operators: 1/4 hp minimum, self-contained.

2.3 AUTOMATIC ENTRANCE DOOR ASSEMBLIES

A. Comply with ADA Standards for egress requirements.

B. Framing Members: Provide manufacturer's standard extruded aluminum framing, reinforced as required to support imposed loads.
   1. Nominal Sizes:
      a. Single Slide and Bi-Parting Sliding Doors: 1-3/4 inch wide by 4-1/2 inch deep.
   2. Concealed Fastening: Provide concealed fastening pocket in framing, with continuous flush insert cover extending full length of each framing member.

C. Door and Sidelight Construction: Heavy duty interlocked extruded aluminum tubular stile and rail sections, through-rod bolted construction with steel corner support at hinge stile of carrier-suspended swinging panels or mechanically fastened corners with welded reinforcing brackets to reduce sag in sliding or breakout mode.
   1. Door Thickness: 1-3/4 inch, nominal.
   2. Stile Design:
      a. Narrow stile, 2 inch, nominal width.
   3. Top Rail Height: 4 inch, nominal.
   4. Bottom Rail Height: 10 inch, nominal.
   5. Glazing Stops: Manufacturer's standard snap-on extruded aluminum square stops with preformed resilient glazing gaskets.
   6. Glazing Stop Width: Manufacturers standard.
   7. Glazing Thickness: 1 inch, nominal, insulated glazing unit. Refer to Section 088000 - Glazing for more information.
   8. Provide 6 inch deep jamb tubes for connection to curtain wall systems, where required.

2.4 CONTROLLERS, ACTUATORS, AND SAFETIES

A. Controller: Provide microprocessor operated controller for each door.

B. Comply with BHMA A156.10 for actuator and safety types and zones.

C. Proximity Detector Actuator/Safety: Microwave; distance of control sensitivity adjustable.

2.5 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics:
1. 120 volts, single phase, 60 Hz.
2. 5 Amp, minimum

B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to {RS#1870}.

C. Provide single pole disconnect switch. See electrical drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install equipment in accordance with manufacturer's written instructions, except where more stringent requirements are specified.

B. Install entrances securely anchored in place, plumb, level, and true to location, in alignment with established lines and grades, without warp, bow, or racking of members.

C. Provide for thermal expansion and contraction of door and frame units and live and dead loads that may be transmitted to operating equipment.

D. Provide for dimensional distortion of components during operation.

E. Coordinate installation of components with related and adjacent work; level and plumb.

3.2 ADJUSTING

A. Adjust entrances for correct function and smooth operation, without binding or scraping and without excessive noise; lubricate operating hardware and other moving parts.

3.3 CLEANING

A. Remove temporary protection; clean exposed surfaces.

3.4 CLOSEOUT ACTIVITIES

A. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum doors.

B. Single Source Requirement
   1. All products listed in Sections 084313 - Aluminum-Framed Storefronts and 084413 - Glazed Aluminum Curtain Walls shall be by the same manufacturer.

1.2 RELATED REQUIREMENTS

A. Section 084229 - Automatic Entrances.

B. Section 084413 - Glazed Aluminum Curtain Walls.

C. Section 087100 - Door Hardware: Hardware items other than specified in this section.

D. Section 088000 - Glazing: Glass and glazing accessories.

1.3 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners.

C. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.7 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 BASIS OF DESIGN -- SWINGING DOORS

A. Medium Stile, Insulating Glazing, Not Thermally-Broken:
   1. Basis of Design: Kawneer North America; 350 Heavy Wall Swing Door; www.kawneer.com.
   2. Thickness: 2 inches.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another manufacturer.

C. Substitutions: See Section 016000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.2 COMPONENTS

A. Glazing: See Section 088000. Ship open for 1" glazing.
   1. For Interior Framing: Type G-1.

B. Swing Doors: Glazed aluminum.
   1. Top Rail: 3-1/2 inches wide.
   2. Vertical Stiles: 3-1/2 inches wide.
   3. Bottom Rail: 10 inches wide.
   4. Glazing Stops: Square.
   5. Finish: Same as curtain wall system.

2.3 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Fasteners: Stainless steel.

2.4 FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

B. Color: As selected by Architect from manufacturer's full range.

2.5 HARDWARE

A. For each door, include sill sweep strip and threshold.

B. Other Door Hardware: See Section 087100.

C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

D. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.2 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.3 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.4 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 084413
GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.1 Section Includes

A. Aluminum-framed curtain wall, with vision glazing.

B. Single Source Requirement
   1. All products listed in Sections 084313 - Aluminum-Framed Storefrontsand 084413 - Glazed Aluminum Curtain Walls shall be by the same manufacturer.

1.2 Related Requirements

A. Section 084229 - Automatic Entrances.

B. Section 084313 - Aluminum-Framed Storefronts: Entrance doors.

C. Section 088000 - Glazing.

1.3 Reference Standards

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

F. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

I. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound

Transmission Loss of Building Partitions and Elements; 2023.

K. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

M. ASTM E413 - Classification for Rating Sound Insulation; 2022.

N. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).

O. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).

1.4 Administrative Requirements

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 Submittals

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 12 by 12 inches in size illustrating finished aluminum surface, glazing, and glazing materials.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

G. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

H. Designer's Qualification Statement.

I. Manufacturer's Qualification Statement.

J. Installer's Qualification Statement.

K. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's

name and registered with manufacturer.

1.6 Quality Assurance

A. Designer Qualifications: Design curtain wall and its structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.7 Delivery, Storage, and Handling

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.8 Field Conditions

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.9 Warranty

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Complete forms in Owner's name and register with installer.

C. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 Manufacturers

A. Basis of Design: Kawneer North America; 1600 Wall System 1 Curtain Wall; www.kawneer.com.

B. Glazed Aluminum Curtain Walls Manufacturers:
1. An approved equal.
2. Substitutions: See Section 016000 - Product Requirements.

2.2 Curtain Wall

A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Outside glazed, with pressure plate and mullion cover.
   2. Fabrication Method: Either shop/factory or field fabricated system with shear block.
   3. Glazing Method: Field glazed system, for 1 inch insulated glazing.
   4. Glzaing System: Four-sided Captured
   5. Glazing Plane: Front
   6. Vertical Mullion Face Width: 2-1/2 inches.
   7. Vertical Mullion Depth From Face of Glazing to Back of Frame: 6 inches.
   8. Finish: Superior performing organic coatings.
      a. Factory finish surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
      c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
   9. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   10. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   11. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   12. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.
   13. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   14. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
   1. Design Wind Loads: Comply with the requirements of ASCE 7
      a. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch, whichever is less and with full recovery of glazing materials.
      b. Member Deflection: For spans over 13 feet 6 inches and less than 40 feet, limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch, with full recovery of glazing materials.
   2. Movement: Accommodate the following movement without damage to components or deterioration of seals:
      a. Expansion and contraction caused by 180 degrees F surface temperature.
      b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
      c. Movement of curtain wall relative to perimeter framing.
      d. Deflection of structural support framing, under permanent and dynamic loads.

C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor

face when tested as follows:
1. Test Pressure Differential: 15 psf.
2. Test Method: ASTM E331.

D. Air Leakage: 0.06 cfm/sq ft maximum leakage of wall area when tested in accordance with ASTM E283/E283M at 6.24 psf pressure difference across assembly.

E. Thermal Performance Requirements:
1. Condensation Resistance Factor of Framing: 70, minimum, measured in accordance with AAMA 1503.
2. Overall U-value Including Glazing: 0.43 Btu/(hr sq ft deg F), maximum.

F. Acoustical Performance Requirements:
1. Sound Attenuation: STC of 31, minimum, from exterior to interior.
2. Test Method: ASTM E90, with calculation in accordance with ASTM E413.

2.3 Components

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Framing members for interior applications need not be thermally broken.
2. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: See Section 088000.
1. For Exterior Framing: Type IG-1.
2. For Interior Framing: Type G-1.

2.4 Materials

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063-T6 alloy and temper, not lett than 0.070 inches wall thickness at any location for the main frame.

B. Sheet Aluminum: ASTM B209/B209M.

C. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.

D. Exposed Flashings: Aluminum sheet, 20-gauge, 0.032-inch minimum thickness; finish to match framing members.

E. Weatherseal Sealant: Silicone, with adhesion in compliance with ASTM C794; compatible with glazing accessories.

F. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, and compatible with flashing material.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Accessories: See Section 088000.

2.5 Finishes

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

B. Color: To be selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.1 Installation

A. Install curtain wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

H. Pressure Plate Framing: Install glazing using exterior dry glazing method; see Section 088000.

I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.2 Tolerances

A. Maximum Variation from Plumb: 0.06 inch per 3 feet noncumulative or 0.5 inches per 100 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.3 Field Quality Control

A. Provide services of curtain wall manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 014000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

C. Provide field testing of installed curtain wall system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as indicated on drawings.
   2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
   3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
      a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
   4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.
      a. Maximum allowable rate of air leakage is 0.09 cfm/sq ft.

D. Repair or replace curtain wall components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.4 Cleaning

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, take care to remove dirt from corners, and wipe surfaces clean.

END OF SECTION

SECTION 085300
PLASTIC WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Polymer steel-reinforced Supera 74 Passive windows.

B. Configurations of windows required: fixed, in-swing casement, and out-swing awning.

1.2 REFERENCES

A. Publications listed below are part of this specification to the extent they are referenced. When publications are cited in these specifications by use of shortened names or by standard number alone, it must be understood that reference is made to the full publication and edition as listed here.

B. AAMA/WDMA/CSA 101/I.S.2/A440-08/12: North American Fenestration Standard/Specification for windows, doors, and skylights (use appropriate specifications depending on certification for each product type).

C. NFRC: National Fenestration Rating Council:
   1. 100: Procedure for Determining Fenestration Product U-Factors
   2. 200: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence
   3. 500: Procedure for Determining Fenestration Product Condensation Resistance Values

D. E 90-09: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

E. E 413: Classification for Rating Sound Insulation

F. E 1332: Standard Classification for Rating Outdoor-Indoor Sound Attenuation

G. E 2235-04 (2012): Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods

H. E 2190: Standard Specification for Insulating Glass Unit Performance Evaluation.

I. ANSI Z97.1-2015 and CPSC 16 CRF 1201 (1977)

J. American Society of Civil Engineers: ASCE 7-05 Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 2010

1.3 PERFORMANCE REQUIREMENTS FOR WINDOWS

A. Windows shall meet a rating of DP 40.1 specifications in accordance with ANSI/AAMA/NWWDA 101/I.S.2/A440-08/12.

B. Windows shall be CW Class.

C. Windows Air Leakage - Fixed Unit, ASTM E 283: Window air leakage when tested at 75 Pa (1.57 psf) shall be 0.1 cfm/ft2 or less.

D. Windows Air Leakage - Operable Unit, ASTM E 283: Window air leakage when tested at 75 Pa (1.57 psf) shall be 0.1 cfm/ft2 or less.

E. Windows Water Penetration - Fixed Unit, ASTM E 547 and ASTM E 331: No water penetration through window when tested under static pressure of 290 Pa (6.06 psf).

F. Windows Water Penetration - Operable Unit, ASTM E 547 and ASTM E 331: No water penetration through window when tested under static pressure of 290 Pa (6.06 psf).

G. Thermal Performance: Windows have been tested in accordance with the NFRC. The products were evaluated in full compliance with NFRC requirements. The Windows, including glass and Polymer framing, shall have a thermal transmittance of:
1. U-factor (Btu/hr/ft2/°F): Fixed: 0.15 maximum/ U-factor (Btu/hr/ft2/°F): Fixed Center of Glass: 0.117 maximum
2. U-factor (Btu/hr/ft2/°F): Operable: 0.19 maximum/U-factor (Btu/hr/ft2/°F): Operable Center of Glass: 0.118 maximum
3. SHGC: Fixed: 0.3 maximum/SHGC: Fixed Center of Glass: 0.36 maximum
4. SHGC: Operable: 0.2 maximum/SHGC: Operable Center of Glass: 0.37 maximum
5. VT: Fixed: 0.51 minimum/VT: Fixed Center of Glass: 0.63 minimum
6. VT: Operable: 0.33 minimum/VT: Operable Center of Glass: 0.64 minimum

1.4 THERMAL MOVEMENT

A. Allow for thermal movement of the window based on site mean temperature +/- 70 F, window/element size and coefficient of linear expansion of Polymer.

1.5 ACOUSTICAL PERFORMANCE

A. Windows shall meet or exceed requirements of OITC, when tested in accordance to ASTM E 1332; or STC, when tested according to ASTM E 90. The windows, including glass and Polymer framing, shall have an acoustical performance of:
1. Fixed window: STC: 28-33, OITC: 20-25.
2. Operable windows: STC: 33, OITC: 24.

1.6 SUBMITTALS

A. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.

B. Product Data: Submit manufacturer's product data, including installation instructions

1.7 DELIVERY

A. A temporary covering shall protect exposed surfaces after completing fabrication of products.

B. Deliver in manufacturer's original packaging with labels intact.

1.8 STORAGE AND HANDLING

A. Products are heavy and fragile. Special care, sufficient manpower, tools, and equipment shall be used for unloading, transporting, warehousing, and installing the products. Two forklifts should be used to unload container on job site.

B. Industrial straps (at least 5,000 lbs.) MUST be used to unload large pallets.

C. Store window units in an upright position in a clean and dry storage area above ground to protect from weather.

D. Cover materials with tarpaulins or plastic hung on frames to provide air circulation and prevent contaminants from contacting polymer.

E. Remove all paper type wrappings and interleaving that are wet or which could become wet when unloading materials.

F. Glass must never be stored or transported in a horizontal/flat orientation.

G. Store crated glass in a cool, dry, and well-ventilated area where it will not be subject to rain or direct sun.

H. Minimize handling by scheduling shipments by floors and by initially locating crated products as close to their installation as possible.

I. Use mechanized window handling and installation equipment with vacuum suction cups for windows heavier than 150 lbs.

J. For a more information about storage and handling windows, refer to the complete and current instructions are available at https://www.intuswindows.com/support-documents/

1.9 INTUS Windows LIMITED WARRANTY*:

A. The products supplied by Seller shall be free from material defects, in material and workmanship, for a period of 10 years from the date of substantial completion of the project.

B. Clear insulating glass with stainless steel or warm edge spacers is warranted against seal failure resulting in visible obstruction through the glass for 10 years from the SOW date under the normal use conditions. Glass is warranted against stress cracks caused by manufacturing defects for one (1) year from the SOW date

C. The polymer white profiles without laminate will resist cracking, peeling, chalking, blistering, flaking, and significant ultraviolet discoloration (greater than 6 Delta E) caused by natural environmental atmospheric conditions for the period of 5 years from the SOW date.

D. Non-glass components are warranted to be free from manufacturing defects for 5 years from the SOW date.

E. The architectural louvers will be free from defects in material and workmanship for a period of 5 years from the SOW date.
   1. Finish Warranty:

a. AAMA 2604 finish is warranted for a period of 10 years from the SOW date.
b. AAMA 2605 finish is warranted for a period of 20 years from the SOW date.

*The following limited warranty is subject to conditions and exclusions. There are certain conditions or applications over which INTUS Windows has no control. Defect or problems as a result of such conditions or applications are not the responsibility of INTUS Windows. For a full INTUS Windows limited warranty, refer to the complete and current warranty information which is available at https://www.intuswindows.com/support-documents/#9-warranty.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. INTUS Windows: 2720 Prosperity Ave Suite 400-1, Fairfax, Virginia 22031. 1-888-380-9940. www.INTUSWindows.com.

2.2 MATERIALS

A. Window system: Supera 74 Passive; fixed, in-swing casement, and out-swing awning windows.

B. Minimum Outside Nominal Wall Thickness:
1. Primary frame and sash extrusions exterior walls: 0.106” (2.7mm)
2. Secondary extrusions (e.g. glazing stops and closures): 0.059” (1.5mm)

C. Face dimensions (nominal): as indicated on Architectural Drawings.

D. The frames feature accessory grooves which allow for snap-in attachment of Polymer nailing flange, trim profile(s) and mulled window joint covers.

E. Window Sash and Frame shall be configured to receive glazing beads (stops) that snap into the interior side of the insulating glass.

F. Reinforcement:
1. Galvanized steel shall be in size, configuration, and location within the window as indicated in the test reports and INTUS Windows Supera Reinforcement instructions.

G. Weather seals:
1. Co-extruded polymer replaceable weather seals:
a. Shapes, designs, and thickness as needed to satisfy performance requirements
b. Standard color: black

H. Glass:
1. Glass shall comply with requirements of AAMA/WDMA/CSA 101.I.S.2/A440-05, Section 10.2
2. Insulating glass panels shall be triple-glazed and have an overall nominal thickness of 2”
3. Glazing type: annealed float glass, tempered.
4. Glass type: clear, low-e coated (ClimaGuard)
5. Glass thickness: 4mm and 6mm as indicated on drawings
6. Filling: Argon
7. Spacer: Warm edge spacer, 12 mm, 14, mm and 16 mm as indicated on drawings

2.3 HARDWARE

A. Provide manufacturer's standard single handle turn-tilt multi-point locking system. Locking points interact with a manually operated handle to bring window sashes into a turn or a tilt position.

B. Standard hardware is used for securing window sashes and to position them in different ventilation positions. Normally it is necessary to overcome the counter force of a seal when closing. Any other type of usage is not in accordance with the intended application. Windows for special applications (i.e. burglar-resistance or for installation in humid conditions / in environments with corrosive atmospheric substances) require special fittings with separately agreed performance criteria, designed for the particular application.

C. Handle: Provide standard handle. Standard Color: White

D. Limiters: 4″ limiter without friction, 4″ limiter with friction

2.4 FASTENERS

A. Exposed fasteners shall be selected to prevent galvanic reaction with any reinforcement materials fastened.

B. Above criteria is applicable to screws used to secure internal reinforcement and to fasteners used in window mulling connections, if required.

C. Avoid exposed fasteners to greatest extent possible.

D. Where exposed fasteners are unavoidable in finished surfaces, use flathead countersunk Phillips head screws.

E. Installation anchors must be approved by the responsible engineer/architect for the project.

2.5 INSECT SCREEN

A. Aluminum frame profile with fiberglass net.

B. Frame finish: to match the exterior window frame finish.

C. Net finish: grey

D. Shipped separately, installed by the client.

E. Insect screens are mounted on the outside of the window. They must be removable from the inside.

2.6 INSTALLATION ACCESSORIES

A. Mounting brackets and screws

2.7 FINISH

A. Standard Colors: White interior, White exterior

B. Protection:
   1. Provide film to protect exposed finished surfaces during shipment, storage, and installation whenever possible
   2. Film shall not affect factory finish after finished component is installed and film is stripped, no residue, adhesive, or film covering, visual non-uniformity or other deleterious effects or substances shall remain on surfaces
   3. Factory applied protective film must be removed immediately after installation
   4. When cleaning agents/paint etc. are applied to the building the windows must be protected

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Before installation, examine window openings and adjacent building structure where windows will be applied for conditions that will prevent proper execution of this portion of Work and endanger permanency. Do not proceed with installation until defects have been corrected.

B. Verify sealant compatibility and adhesion to Polymer in conjunction with sealant manufacturer.

C. Acceptance of Condition: Beginning installation confirms acceptance of existing conditions.

3.2 INSTALLATION

A. General Requirements:

B. Comply with manufacturer’s instruction and recommendations for installation of work.

C. Do not erect warped, bowed, deformed, or otherwise damaged or defaced members. Replace materials that are damaged during installation as directed.

D. Set units level, plumb, and true to line, with uniform joints. Support units on shims and secure in place by approved installation anchors/fasteners that properly engage into supporting structure.

E. Insulation must be used around the perimeter of the window in accordance with shop drawings and the insulation manufacturer’s guidelines. Insulation must allow for expansion and contraction of the installed window.

F. Flashing and other materials used around window opening shall be corrosion-resistant, non-staining, non-bleeding, and compatible with adjoining materials.

G. Erection Tolerances:
   1. Variations from Plumb: +/- 1/8” maximum in window height
   2. Variations from Level: +/- 1/8” maximum in 10’ run, non-cumulative

H. 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 E 2112.

3.3 FIELD QUALITY CONTROL

A. Field Check for Water Leakage:
   1. Newly installed fenestration product(s) shall be field tested in accordance with AAMA 502-12, "Voluntary Specification for Field Testing of Newly Installed Fenestration Products."
   2. AAMA 502-12 test shall be performed during construction, prior to an issuance of the building occupancy permit, but no later than six months after installation of the fenestration products.
   3. Architect will determine the quantity and type(s) of window(s) to be tested.
   4. In case of water penetration take corrective action and re-test as necessary until the problem is resolved.
   5. Default field test conditions are not the same as NAFS requirements for lab testing.
   6. Unless otherwise specified, water test shall be conducted at a static test pressure equal or less to 2/3 of the tested and rated laboratory performance per AAMA/WDMA/CSA 101/I.S. 2/A440.
   7. CW class windows shall be tested to a complete four-cycle water penetration resistance test in accordance with ASTM E547. Each complete cycle shall consist of 5 minutes with the pressure applied and 1 minute with the pressure released, during which the water spray is continuously applied. The total test duration shall be a minimum of 24 minutes.
   8. Unless otherwise specified the air test shall be conducted at 1.5 times of the tested and rated laboratory performance per AAMA/WDMA/CSA 101/I.S. 2/A440. Or minimum window performance grade rating as per AAMA/WDMA/CSA 101/I.S. 2/A440.

3.4 ADJUSTING

A. Weather seal contact shall be checked, and any required final hardware adjustment made for proper operation and performance of units.

B. Adjustments/maintenance should be made at least once per year.

3.5 CLEANING

A. Remove visible labels and adhesive residue according to manufacturer’s instruction.

B. Clean completed system in compliance with manufacturer’s recommendations, inside and out, promptly after erection and installation of glass and sealants. Remove excess glazing and joint sealants, dirt, and other substances from finished surfaces promptly after erection.

C. Remove protective material from prefinished surfaces.

D. Wash down exposed surfaces using a solution of mild detergent in warm water applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.6 PROTECTION

A. Institute protective measures and other precautions needed to assure Work will be without damage or deterioration, other than normal weathering, at time of acceptance.

B. Protect windows from damage by chemicals, solvents, paint or other construction operations that may cause damage.

END OF SECTION

SECTION 086200
UNIT SKYLIGHTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Skylights with integral frame.

B. Integral insulated curb.

1.2 RELATED REQUIREMENTS

A. Section 077200 - Roof Accessories: Manufactured curbs for installation of unit skylights.

B. Section 088000 - Glazing: For glass type.

1.3 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022.

B. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.6 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide five-year manufacturer warranty including coverage for leakage due to defective skylight materials or construction. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Unit Skylights:
1. Velux America, Inc; VELUX Dynamic Dome: www.veluxusa.com.
2. Wasco Skylights - Part of the VELUX Group; Wasco EcoSky Unit Skylight: www.wascoskylights.com.
3. An approved equal.
4. Substitutions: See Section 016000 - Product Requirements.

2.2 SKYLIGHTS

A. Skylights: Factory-assembled glazing in aluminum frame, free of visual distortion, and weathertight.
1. Shape: Square dome.
2. Glazing: Double.
3. Operation: None; fixed.
4. Roof Slope: Flat.
5. Nominal Size: 60 by 60 inch.

2.3 PERFORMANCE REQUIREMENTS

A. Provide unit skylights that comply with the following:
1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific skylight type:
a. Performance Grade (PG): 35, with minimum design pressure (DP) of 35.0 psf.
2. Allow for expansion and contraction within system components caused by a cycling surface temperature range of 170 degrees F without causing detrimental effects to system or components.
3. Energy Code Compliance: Comply with ICC (IBC), ASHRAE Std 90.1 I-P, or the authorities having jurisdiction as required for unit skylights.

2.4 Design Criteria

A. Unit Skylight Design: Design and size components to withstand dead loads and live loads caused by snow, hail, and positive and negative wind loads acting on skylight unit without damage or permanent set.
   1. Regulatory Requirements: Comply with applicable code criteria for loads.

2.5 COMPONENTS

A. Double Glazing: IGU2; factory sealed. Refer to Seciton 088000 - Glazing.

B. Frames: ASTM B221 ASTM B221M Extruded aluminum thermally broken, reinforced and welded corner joints, integral curb frame mounting flange and counterflashing to receive roofing flashing system, with integral condensation collection gutter, glazing retainer; clear anodized finish.

C. Support Curbs: Sheet aluminum ASTM B209/B209M, sandwich construction; 1 inch wide, 10 inches high; glass fiber insulation; with integral flange for anchorage to roof deck.

2.6 ACCESSORIES

A. Anchorage Devices: Type recommended by manufacturer, concealed.

B. Counterflashings: Same metal type and finish as skylight frame.

C. Sealant: Elastomeric, silicone or polyurethane, compatible with material being sealed .

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that openings and substrate conditions are ready to receive work of this section.

3.2 INSTALLATION

A. Install aluminum curb assembly, fastening securely to roof decking; flash curb assembly into roofing system.

B. Install skylight units and mount securely to curb assembly; install counterflashing as required.

C. Apply sealant to achieve watertight assembly.

3.3 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash down exposed surfaces; wipe surfaces clean.

C. Remove excess sealant.

END OF SECTION

SECTION 086300
METAL-FRAMED SKYLIGHTS

PART 1 GENERAL

1.1 Section Includes

A. Aluminum skylight framing system.

B. Skylight glazing.

1.2 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Fabricated steel framed opening.

B. Section 088000 - Glazing: For glazing type.

1.3 REFERENCE STANDARDS

A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

F. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

I. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

L. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's specifications, standard details, and installation requirements.

C. Shop Drawings: Indicate framed opening requirements and tolerances, spacing of members, anticipated deflection under load, affected related work, expansion and contraction joint locations and details, and sizes and locations for field welding.

D. Design Data: Provide framing member structural and physical characteristics and engineering calculations, including lateral thrust loads anticipated, and identify dimensional limitations.

E. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

F. Designer's qualification statement.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Design skylight system under direct supervision of a professional engineer experienced in design of system type specified and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not fewer than three years of documented experience.

C. Installer Qualifications: Company specializing in performing the type of work specified in this section with at least three years of documented experience.

1.6 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work, including leaks, discoloration, failure of seal at insulated glazing units, and excessive thermal or structural movement, within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal-Framed Skylights Manufacturers:
   1. Wasco Skylights - Part of the VELUX Group; Wasco Pinnacle Skylight System: www.wascoskylights.com.
   2. An approved equal.
   3. Substitutions: See Section 016000 - Product Requirements.

2.2 METAL-FRAMED SKYLIGHTS

A. Metal Framed Skylights: Factory-fabricated, and glazed.
   1. Frame: Extruded aluminum structural members with integral condensation collection and guttering system thermally separated from exterior pressure bar.
   2. Glazing System: Pressure glazing bar system.
   3. Glazing: Insulating glass, IGU2.
   4. Aluminum Finish: High performance organic coatings.
   5. Fabricate to prevent vibration harmonics, thermal movement transmitted to other building elements, and loosening, weakening, or fracturing of attachments or components of system.

2.3 PERFORMANCE REQUIREMENTS

A. Provide metal-framed skylights that comply with the following:
   1. Structural Design: Design and size components to withstand dead loads and specified live loads without damage or permanent set.
   2. Wind Loads: Test in accordance with ASTM E330/E330M, using loads 1.5 times the specified design pressures and 10 second duration of maximum load.
   3. Design Pressure (DP): In accordance with applicable codes.
   4. Glazing Support Member Deflection Under Wind Load: 1/180 of span, maximum.
   5. Thermal Movement: Design system to accommodate thermal expansion and contraction over ambient temperature range of 100 degrees F, dynamic loading and release of loads, creep of concrete structural members, and deflection of structural support framing without damage to skylight system components or loss of weathertightness.
   6. Energy Code Compliance: Comply with ICC (IBC), ASHRAE Std 90.1 I-P, or the authorities having jurisdiction as required for metal-framed skylights.
   7. Air Leakage: 0.30 cfm/sq ft maximum leakage when tested at 1.57 psf pressure difference in accordance with ASTM E283/E283M.
   8. Water Penetration: None, when measured in accordance with ASTM E331 at a test pressure difference of 2.86 pounds per square foot.

2.4 MATERIALS

A. Aluminum Extrusions: Alloy and temper 6063-T5, 6063-T6, or 6061-T6 members complying with ASTM B221 (ASTM B221M), with minimum thickness 1/8 inch for structural members and 1/16 inch for non-structural members.

B. Formed Aluminum: Sheet material of alloy 5052, 5005, or 6061-T651 members complying with ASTM B209/B209M, with minimum thickness 1/8 inch for structural members and 1/16 inch for non-structural members.

C. Internal Reinforcement: ASTM A36/A36M Steel shapes as required for strength and mullion size limitations, hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

D. Insulating Glass: Sealed insulated units, outer pane of clear transparent, laminated glass; inner pane of clear transparent, laminated glass; space of sealed air, metal edge frame.

E. Glazing Accessories: As recommended by manufacturer of skylight system.

F. Touch-Up Primer for Galvanized Steel Surfaces: Zinc rich type.

2.5 FABRICATION

A. Rigidly fit and secure joints and corners with screw and spline; fabricate rigid joints with connections that are flush, hairline, and weatherproof.

B. Fabricate components to allow for expansion and contraction with minimum clearance and shim spacing around perimeter of assembly.

C. Drain to exterior any water entering exterior joints, condensation occurring in glazing channels, or migrating moisture occurring within system.

D. Prepare components to receive concealed anchorage devices, and ensure that fasteners will be concealed upon completion of installation.

2.6 FINISHES

A. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system; interior surfaces only.

B. Color: To be selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install metal-framed skylights in accordance with manufacturer's instructions.

B. Set skylight structure plumb, level, and true to line, without warp or rack of frames or glazing panels. Anchor securely in place in accordance with approved shop drawings.

C. Maintain assembly dimensional tolerances, aligning with adjacent work.

D. Install base flashings in accordance with Section 076200.

E. Touch up damaged finishes so repair is imperceptible from 6 feet distance, and remove and replace components that cannot be acceptably touched up.

3.2 FIELD QUALITY CONTROL

A. Provide services of metal-framed skylight manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 014000 - Quality Requirements for general testing and inspection requirements.

C. Water-Spray Test: Provide water spray quality test of installed metal-framed skylight components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as indicated on drawings.

D. Repair or replace metal-framed skylight components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.3 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash down exposed surfaces; wipe surfaces clean.

END OF SECTION

SECTION 088000
GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds.

1.2 RELATED REQUIREMENTS

A. Section 072600 - Vapor Retarders/Air Barriers.

B. Section 084229 - Automatic Entrances: Glazing provided as part of automatic entrance systems

C. Section 079200 - Joint Sealants: Sealants for other than glazing purposes.

D. Section 084313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

E. Section 084413 - Glazed Aluminum Curtain Walls: Glazing provided as part of wall assembly.

F. Section 086200 - Unit Skylights: Glazing furnished as part of skylight units.

G. Section 086300 - Metal Framed Skylights: Glzaing furnished as pare of skylight units.

H. Section 088723 - Safety and Security Films.

I. Section 102310 - Glazed Interior Door and Wall Assemblies: Glazing provided as part of interior door and wall systems.

1.3 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. ASTM C1036 - Standard Specification for Flat Glass; 2021.

G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

H. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2019.

I. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

J. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

K. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

L. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

M. GANA (SM) - GANA Sealant Manual; 2008.

N. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2020.

O. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2020.

P. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2020.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.7 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Glass Fabricators:
1. Viracon, Inc: www.viracon.com/#sle.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

B. Float Glass Manufacturers:
1. Vitro Architectural Glass (formerly PPG Glass); Solarban 70: www.vitroglazings.com.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Design Pressure: Calculated in accordance with ASCE 7.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
4. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
1. In conjunction with weather barrier related materials described in other sections, as follows:
   a. Vapor Retarders: See Section 072600.
2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly

from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.3 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
2. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
3. Wired Glass Type: ASTM C1036, Type II - Wired Flat Glass, Quality - Q6, with color and performance characteristics as indicated.
4. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.4 INSULATING GLASS UNITS

A. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

B. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Warm-Edge Spacers: Low-conductivity thermoplastic with dessicant warm-edge technology design.
a. Spacer Width: As required for specified insulating glass unit.
b. Spacer Height: Manufacturer's standard.
4. Spacer Color: Black.
5. Edge Seal:
a. Single-Sealed System: Provide silicone, polysulfide, or polyurethane sealant as seal applied around perimeter.
b. Color: Black.
6. Purge interpane space with argon gas.

C. Type IGU1 - Insulating Glass Units: Vision glass, double glazed, tempered safety glazing.
1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.

3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
   b. Coating: Low-E (solar control type), on #2 surface.
4. Warm-edge spacer.
5. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
6. Total Thickness: 1 inch.
7. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.24, nominal.
8. Glazing Method: Dry glazing method, gasket glazing.

D. Type IGU2 - Insulating Glass Units: Vision glass, double glazed, laminated safety glazing.
1. Applications: Community Room Exterior Windows.
2. Space between lites filled with air.
3. Outboard Lite: Laminated, 1/4 inch thick, minimum.
   a. Tint: Clear.
   b. Coating: Low-E (solar control type), on #2 surface.
4. Warm-edge spacer.
5. Inboard Lite: Laminated float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
6. Total Thickness: 1 inch.
7. Glazing Method: Dry glazing method, gasket glazing.

2.5 GLAZING UNITS

A. Type G1 - Monolithic Interior Vision Safety Glazing:
1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Fully tempered float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.
5. Glazing Method: Dry glazing method, tape and gasket spline.

B. Type G2 - Wired Glass: Flat glass with embedded wire mesh.
1. Applications: Vision panels in fire resistance-rated doors.
2. Form: Form 1 - Wired glass, polished both sides; ASTM C1036.
3. Mesh: M1 - Diamond; ASTM C1036.
4. Tint: Clear, Class 1.
5. Glass Type: Annealed.
6. Thickness: 1/4 inch, nominal.
7. Glazing Method: Dry glazing method, tape and tape.

C. Type G3 - Monolithic Interior Vision Glazing for Metrowall Partitions:
1. Applications: As scheduled.
2. Glass Type: Fully tempered float glass.
3. Tint: Clear.
4. Thickness: 1/2 inch, nominal.

D. Type G4 - Monolithic Interior Vision Glazing for Metrowall Partitions:
1. Applications: As scheduled.
2. Glass Type: Laminated float glass.

3. Tint: Clear.
4. Thickness: 1/2 inch, nominal.

2.6 Laminated Glass Interlayers

A. Type LGI-1 - Polyvinyl Butyral (PVB) Interlayer for Laminated Glazing:
1. Functionality: Post-breakage safety and security.
2. Applications:
a. Interior and Exterior laminated panes of insulating glass unit, Type IGU2.
3. Color: Clear.
4. Thickness: As required for indicated performance of laminated glass application.
5. Manufacturers:
a. Eastman Chemical Company; Saflex Clear PVB Interlayer: www.saflex.com/#sle.
b. An approved equal.
c. Substitutions: See Section 016000 - Product Requirements.

2.7 GLASS COATINGS

A. Solar Control Coating: Two-component, metal-oxide nano-particles with 5 percent solids content, minimum.
1. Application: Locations as indicated on drawings.
2. Color: Clear, fade resistant.
3. Dry Film Thickness: 10 microns, bubble and crack resistant.
4. Visible Light Transmission: Maintains up to 80 percent.
5. Ultraviolet Light Reduction: 99.9 percent.
6. Solar Heat Gain Coefficient: 0.53.
7. Shading Coefficient: 0.72.
8. Manufacturers:
a. DryWired; Liquid NanoTint 2.0: www.drywired.com/#sle.
b. An approved equal.
c. Substitutions: See Section 016000 - Product Requirements.

2.8 GLAZING COMPOUNDS

A. Type GC-2 - Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

2.9 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
1. Width: As required for application.
2. Thickness: As required for application.
3. Spacer Rod Diameter: As required for application.

C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Verify that sealing between joints of glass framing members has been completed effectively.

D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

3.4 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.5 INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

F. Carefully trim protruding tape with knife.

3.6 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

A. Application - Interior Glazed: Set glazing infills from the interior of the building.

B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

E. Place glazing tape on free perimeter of glazing in same manner described above.

F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

G. Carefully trim protruding tape with knife.

3.7 INSTALLATION - PRESSURE GLAZED SYSTEMS

A. Application - Exterior Glazed: Set glazing infills from exterior side of building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install pressure plates without displacing glazing gasket; exert pressure for full continuous contact.

E. Install cover plate.

3.8 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.9 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.10 SCHEDULES

A. Aluminum-Framed Storefront Glazing: Glass Type IGU1 or IGU2 (where indicated on drawings), install glass using dry gasket system, and with glass thickness as required to comply with performance requirements indicated in Section 084313.

B. Glazed Aluminum Curtain Wall Glazing: Glass Type IGU1 or IGU2 (where indicated on drawings), install glass using pressure glazed dry system, and with glass thickness required to comply with performance requirements indicated in Section 084413.

C. Metal-Framed Skylight Glazing: Glass Type IGU2, install glass using pressure glazing bar system.

D. Unit Skylight Glazing: Glass Type IGU2.

E. Hollow Metal Steel Frames, Interior Glazing: Glass Type G1, install glass using dry tape/tape method.

F. Steel Door Glazing:
1. Interior: Glass Type G2, 1/4 inch thick, install glass using dry tape/tape method, or as required by manufacturer for rating.

G. Sliding Glass Exterior Door Glazing: Glass Type IGU1, install glass using dry method.

H. Sliding Glass Interior Door Glazing: Glass Type IGU1, install glass using dry method.

I. Glazed Interior Door and Wall Assemblies: Glass Type G3 on interior room side of partition and Type G4 on exterior room side of partition, as indicated on drawings. Install glass using dry method, in accordance with assembly manufacturer.

END OF SECTION

SECTION 088723
SAFETY AND SECURITY FILMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glazing film applied to new glazing assemblies.

B. New Glazing: Factory or shop install film to glazing before installation in frames.

C. Glazing assemblies to receive film are indicated on drawings.

1.2 RELATED REQUIREMENTS

A. Section 088000 - Glazing: New glazing to received film.

B. Section 102310 - Glazed Interior Door and Wall Assemblies

1.3 REFERENCE STANDARDS

A. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Record of product certification for safety requirements.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Shop Drawings: Detailing installation of film, anchoring accessories, and sealant.

D. Samples: For each film product to be used, minimum size 4 inches by 6 inches, representing actual product, color, and patterns.

E. Test Reports: Detailed reports of full-scale chamber tests to specified criteria, using assemblies identical to those required for this project.

F. Specimen Warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Glazing film manufacturer specializing in manufacture of safety glazing films with minimum 10 years successful experience.

B. Installer Qualifications: Certified by glazing film manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of authorities having jurisdiction.

1.7 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

A. Provide 10 year manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. 3M Window Film; Fasara Brand: www.solutions.3m.com.

B. An approved equal.

C. Substitutions: See Section 016000 - Product Requirements.

2.2 SAFETY AND SECURITY GLAZING FILM

2.3 MATERIALS

A. Glazing Film: Transparent polyester film for permanent bonding to glass.
   1. Thickness: 0.008 inch, minimum.
   2. Color: As indicated on drawings.
   3. Construction: Polyester and Polyester/PVC blend.
   4. Adhesive Type: Pressure sensitive acrylic.
   5. Release Liner: Silicone-coated polyester.
   6. Thickness: Film and Adhesive: +/- 3.3 mils
   7. Tensile Strength: 45 psi minimum when tested in accordance with ASTM D882.
   8. Typical Adhesion 24 hours After Application: 1.6 lbs/inch
   9. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84 (Class A).

B. Accessory Materials: As recommended or required by film manufacturer.

C. Glass Cleaner: As recommended by glazing film manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine glass and frames. Verify that existing conditions are adequate for proper application and performance of film.

B. Verify glass is not cracked, chipped, broken, or damaged.

C. Verify that frames are securely anchored and free of defects.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.

B. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.

C. Protect adjacent surfaces.

D. Do not begin installation until substrates have been properly prepared.

3.3 INSTALLATION

A. Do not apply glazing film when surface temperature is less that 40 degrees F or if precipitation is imminent.

B. Install in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.

C. Accurately cut film with straight edges to required sizes allowing 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required by anchorage method.

D. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.

E. Clean glass and anchoring accessories following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.

F. Remove labels and protective covers.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 090561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile.
   2. Carpet tile.
   3. Thin-set porcelain tile.

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

D. Testing of existing concrete floor slabs for moisture and alkalinity (pH) has already been conducted; test report is attached. Refer to Appendix material.

E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.

F. Remedial floor treatment.

1.2 RELATED REQUIREMENTS

A. Section 035400 - Cast Underlayment: Self-leveling floor underlayments for correcting floor flatness and leveling on concrete floor slabs.

1.3 REFERENCE STANDARDS

A. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.4 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

C. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.

D. Adhesive Bond and Compatibility Test Report.

E. Copy of RFCI (RWP).

1.5 QUALITY ASSURANCE

A. Remedial Treatment Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

PART 2 PRODUCTS

2.1 MATERIALS

A. Remedial Floor Treatment: Multi-layer coating, or coating and overlay combination, intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
   1. Products:
      a. Basis of Design: Stonhard; Stongard MR; www.stonhard.com.
      b. An approved equal.
      c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
      a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
      b. Removal of existing floor covering.
   2. Preliminary cleaning.
   3. Prepare slab for application of remedial floor treatment, in accordance with manufacturer's instructions.
   4. Apply specified remediation.
   5. Patching, smoothing, and leveling, as required.
   6. Other preparation specified.
   7. Adhesive bond and compatibility test.
   8. Protection.

3.2 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.3 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.4 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.5 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.6 APPLICATION OF REMEDIAL FLOOR TREATMENT

A. Comply with requirements and recommendations of treatment manufacturer.

3.7 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Resilient sound isolation clips.

E. Gypsum wallboard.

F. Joint treatment and accessories.

1.2 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Structural steel stud framing.

B. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 072100 - Thermal Insulation: Acoustic insulation.

1.3 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

F. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2020.

G. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

I. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

J. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

N. ASTM E413 - Classification for Rating Sound Insulation; 2022.

O. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions: Provide completed assemblies with the following characteristics:
1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.2 METAL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.
1. Corrosion Protection Coating Designation: G40 in accordance with AISI S220.

B. Manufacturers - Metal Framing, Connectors, and Accessories:
1. MarinoWARE; SoundGuard: www.marinoware.com.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

C. Structural Steel Framing for Application of Gypsum Board: See Section 054000.

D. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
1. Studs: C-shaped with knurled or embossed faces.

2. Paired Studs for Sound-Rated Assemblies: Engineered single-piece assemblies comprised of paired studs coupled by sound isolators, designed to replace conventional side-by-side, parallel, double-wall partition framing.
   a. Widths: As indicated on drawings.
3. Runners: U shaped, sized to match studs.
4. Ceiling Channels: C-shaped.
5. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
6. Resilient Sound Isolation Clips: Steel resilient clips with molded rubber isolators, attaches to framing; improves noise isolation performance of wall and floor-ceiling assemblies.
   a. Products:
      1) ClarkDietrich; Sound Clip (CDSC): www.clarkdietrich.com.
      2) An approved equal.
      3) Substitutions: See Section 016000 - Product Requirements.

E. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and screwed to secondary deflection channel set inside but unattached to top track.

2.3 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
1. Georgia-Pacific Gypsum: www.gpgypsum.com.
2. Gold Bond Building Products, LLC provided by National Gypsum Company: www.goldbondbuilding.com.
3. USG Corporation: www.usg.com.
4. Substitutions: See Section 016000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Thickness:
   a. Vertical Surfaces: 5/8 inch.
   b. Ceilings: 1/2 inch.

C. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
1. Application: Vertical surfaces behind thinset tile, except in wet areas.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Type: Regular, in locations indicated.
4. Regular Board Thickness: 1/2 inch.
5. Edges: Tapered.

2.4 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: See Section 072100.

B. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM

E84.

2. Tape Thickness: 1/4 inch.
3. Products:
   a. Armacell LLC; ArmaComfort MTD: www.armacell.us.
   b. An approved equal.
   c. Substitutions: See Section 016000 - Product Requirements.

C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
   1. Products:
      a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com.
      b. An approved equal.
      c. Substitutions: See Section 016000 - Product Requirements.

D. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel, unless noted otherwise.
   1. Corner Beads: Low profile, for 90 degree outside corners.

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with AISI S220 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
   1. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less

than double studs at jambs.

E. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

F. Resilient Sound Isolation Clips: Install resilient sound isolation clips, and where applicable, associated furring sections and channels, in accordance with clip manufacturer's written instructions.

G. Blocking: Install wood blocking for support of:
1. Framed openings.
2. Wall-mounted cabinets.
3. Plumbing fixtures.
4. Toilet partitions.
5. Toilet accessories.
6. Wall-mounted door hardware.

3.3 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.

C. Acoustic Sealant: Install as follows:
1. Place one bead continuously on substrate before installation of perimeter framing members.
2. Place continuous bead at perimeter of each layer of gypsum board.
3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.4 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

3.6 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint

tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

END OF SECTION

SECTION 093000
TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Stone thresholds.

E. Non-ceramic trim.

1.2 RELATED REQUIREMENTS

A. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures, removal of existing flooring, and preparation.

1.3 REFERENCE STANDARDS

A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017.

B. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

C. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

D. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.

F. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2023.

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).

K. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.

L. ANSI A108.12 - Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Modified Dry-Set Mortar; 2023.

M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).

N. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.

O. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.

P. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.

Q. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2019.

R. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2014 (Reaffirmed 2019).

S. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2019).

T. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2019.

U. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

V. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2023.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

D. Installer's Qualification Statement:

1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Tile: 5 percent of each size, color, and surface finish combination.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

B. Installer Qualifications:
1. Company specializing in performing tile installation, with minimum of five years of documented experience.
a. Accredited Five-Star member of the National Tile Contractors Association (NTCA) or Trowel of Excellence member of the Tile Contractors' Association of America (TCAA).

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.1 TILE

A. Manufacturers:
1. As indicated on drawings. Refer to Finish Schedule.
2. Substitutions: See Section 016000 - Product Requirements.

B. Porcelain Tile, Type PFT1, PFT2, PWT1, PWT2, PWB1: ANSI A137.1 standard grade.
1. Color(s): As indicated on drawings.
2. Products: As indicated on drawings.

2.2 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Satin brass anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
1. Applications:
a. Open edges of wall tile.
b. Wall corners, outside and inside.
2. Manufacturers:
a. Schluter-Systems: www.schluter.com.

b. An approved equal.
c. Substitutions: See Section 016000 - Product Requirements.

B. Thresholds: 2 inches wide by full width of wall or frame opening; beveled edge on both long edges; without holes, cracks, or open seams.
1. Thickness: 1/2 inch.
2. Material: Marble, honed finish.
3. Applications:
a. At doorways where tile terminates.

2.3 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
1. LATICRETE International, Inc: www.laticrete.com/#sle.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

C. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.
2. Products:
a. LATICRETE International, Inc; MULTIMAX LITE: www.laticrete.com.

2.4 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. Standard Grout: ANSI A118.6 standard cement grout.
1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
3. Color(s): As selected by Architect from manufacturer's full line.
4. Products:
a. LATICRETE International, Inc; LATICRETE 1500 Sanded Grout: www.laticrete.com.

2.5 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
1. Crack Resistance: No failure at 1/8 inch gap, minimum.
2. Fluid or Trowel Applied Type:
a. Material: Acrylic.
b. Thickness: 20 mils, maximum.
c. Products:
1) Sika Corp; SikaTile 200 Fracture Guard Rapid: www.sika.com.
2) An approved equal.

3) Substitutions: See Section 016000 - Product Requirements.

B. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
2. Fluid or Trowel Applied Type:
a. Material: Synthetic rubber or Acrylic.
b. Thickness: 25 mils, minimum, dry film thickness.
c. Products:
1) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com.
2) An approved equal.
3) Substitutions: See Section 016000 - Product Requirements.

C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 7/16 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

B. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 090561.
2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.3 INSTALLATION - GENERAL

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Install thresholds where indicated.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive.

J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.

3.5 INSTALLATION - WALL TILE

A. On exterior walls install in accordance with TCNA (HB) Method W244, thin-set over cementitious backer units, with waterproofing membrane.

B. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.
   1. Where waterproofing membrane is indicated , install in accordance with TCNA (HB) Method W222, one coat method.

3.6 CLEANING

A. Clean tile and grout surfaces.

3.7 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

3.8 SCHEDULE - See drawings.

END OF SECTION

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.2 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples 12 by 12 inch in size illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, 6 inches long, of suspension system main runner, cross runner, and perimeter molding.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Manufacturer's qualification statement.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.5 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acoustic Tiles/Panels:
1. Armstrong World Industries, Inc; Calla Tile: www.armstrongceilings.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. Suspension Systems:
1. Same as for acoustical units.

2.2 ACOUSTICAL UNITS

A. Acoustical Panels, Type ____: Painted mineral fiber, with the following characteristics:
1. Classification: ASTM E1264 Type III.
2. Size: 24 by 24 inches.
3. Thickness: 3/4 inch.
4. Panel Edge: Square.
5. Suspension System: Exposed grid.

B. Acoustical Tiles: Mineral fiber with membrane-faced overlay, with the following characteristics:
1. Classification: ASTM E1264 Type IV.
2. Size: 30 by 30 inches.
3. Light Reflectance: 85 percent, determined in accordance with ASTM E1264.
4. NRC 0.85, determined in accordance with ASTM E1264.
5. Articulation Class (AC): 170, determined in accordance with ASTM E1264.
6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
7. Tile Edge: Square.
8. Color: White.
9. Suspension System: Exposed grid.
10. Products:
    a. Armstrong World Industries, Inc; Calla: www.armstrongceilings.com.

2.3 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings as required.
1. Materials:
    a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.

B. Exposed Suspension System: Hot-dipped galvanized steel grid with steel cap.
   1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   2. Profile: Tee; 15/16 inch face width.
   3. Finish: Baked enamel.
   4. Color: White.

2.4 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.
   1. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

C. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

D. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

E. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

F. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

G. Do not eccentrically load system or induce rotation of runners.

3.2 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

END OF SECTION

SECTION 096500
RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Resilient stair accessories.

D. Installation accessories.

1.2 RELATED REQUIREMENTS

A. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

B. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

C. Section 142100 - Electric Traction Elevators: Floor finish in elevator cab.

1.3 REFERENCE STANDARDS

A. ASTM E492 - Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine; 2022.

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).

C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

E. ASTM F2169 - Standard Specification for Resilient Stair Treads; 2015 (Reapproved 2020).

F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.

D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Flooring Material: 150 square feet of each type and color.
3. Extra Wall Base: 100 linear feet of each type and color.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

1.7 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1 TILE FLOORING

A. Vinyl Tile - Type LVT1, LVT2, and LVT3: Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
1. Manufacturers:
   a. Shaw Industries Group, Inc.; Unite Collection, Cove Style 0927V; www.ShawContract.com.
2. Minimum Requirements: Comply with ASTM F1700, Class III, Type B.
3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in

accordance with ASTM E648.
4. Plank Tile Size: 9 by 48 inch.
5. Wear Layer Thickness: 0.020 inch.
6. Tile Edge: Square edge.
7. Style and Color: As indicated on drawings.

B. Vinyl Tile - Type LVT4 and LVT5: Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
1. Manufacturers:
a. Shaw Industries Group, Inc.; Dialogue Collection, Style Coded 4143V; www.ShawContract.com.
2. Minimum Requirements: Comply with ASTM F1700, Class III, Type B.
3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
4. Plank Tile Size: 6 by 48 inch.
5. Wear Layer Thickness: 0.020 inch.
6. Total Thickness: 0.20 inch, nominal.
7. Tile Edge: Square edge.
8. Style and Color: As indicated on drawings.

C. Vinyl Tile - Type LVT6 and LVT7: Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
1. Manufacturers:
a. Interface; Studio Set; www.interface.com.
2. Minimum Requirements: Comply with ASTM F1700, Class III, Type B.
3. Impact Insulation Class (IIC): 64, minimum, when floor-ceiling assembly tested in accordance with ASTM E492.
4. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
5. Plank Tile Size: 9.845 by 39.38 inch.
6. Wear Layer Thickness: 0.022 inch.
7. Total Thickness: ____ inch, nominal.
8. Tile Edge: Square edge.
9. Style and Color: As indicated on drawings.

2.2 STAIR COVERING

A. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness.
1. Manufacturers:
a. Mannington Commercial; Burke Stairway Systems, ColorScape Collection: www.manningtoncommercial.com.
2. Minimum Requirements: Comply with ASTM F2169, Type TS, rubber, vulcanized thermoset.
3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
4. Nominal Thickness: 0.125 inch.
5. Nosing: Square.
6. Striping: 2 inch wide contrasting color abrasive strips.
7. Texture: Smooth.

8. Color: As indicated on drawings.

B. Stair Risers: Full height and width of tread in one piece, matching treads in material and color.
1. Manufacturers:
a. Mannington Commercial; Burke Stairway Systems, Colorscape Collection: www.manningtoncommercial.com.
b. An approved equal.
c. Substitutions: See Section 016000 - Product Requirements.
2. Thickness: 0.080 inch.

2.3 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; style as scheduled.
1. Manufacturers:
a. Johnsonite, a Tarkett Company: www.johnsonite.com.
b. An approved equal.
c. Substitutions: See Section 016000 - Product Requirements.
2. Height: 4 inches.
3. Thickness: 0.125 inch.
4. Finish: Satin.
5. Length: Roll.
6. Color: As indicated on drawings.

2.4 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Adhesive for Vinyl Flooring:
1. Manufacturers:
a. H.B. Fuller Construction Products, Inc; TEC Flexera Premium Universal Adhesive: www.tecspecialty.com.
b. An approved equal.
c. Substitutions: Section 016000 - Product Requirements.

D. Moldings, Transition and Edge Strips: Same material as flooring.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 090561.

2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

3.3 Installation - General

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
1. Spread only enough adhesive to permit installation of materials before initial set.
2. Fit joints and butt seams tightly.
3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4 Installation - Tile Flooring

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install square tile to ashlar pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.5 Installation - Resilient Base

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

C. Scribe and fit to door frames and other interruptions.

3.6 Installation - Stair Coverings

A. Install stair coverings in one piece for full width and depth of tread.

B. Adhere over entire surface. Fit accurately and securely.

3.7 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.8 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.9 SCHEDULE - See drawings.

END OF SECTION

SECTION 096700
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fluid-applied flooring and base.

1.2 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between fluid-applied flooring and adjacent construction and fixtures.

B. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.3 REFERENCE STANDARDS

A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

C. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and application rate for each coat.

E. Manufacturer's Qualification Statement.

F. Applicator's Qualification Statement.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Top Coat Materials: 2 gallons.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section.
   1. Minimum five years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.7 FIELD CONDITIONS

A. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fluid-Applied Flooring:
1. Benjamin Moore; www.benjaminmoore.com.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

2.2 Fluid-Applied Flooring SYSTEMS

2.3 ACCESSORIES

A. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

B. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 090561.
2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.

3.2 PREPARATION

A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with

subfloor filler.

B. Prepare concrete surfaces according to ICRI 310.2R, _____.

3.3 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness required by manufacturer.

C. Finish to smooth level surface.

3.4 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 096813
TILE CARPETING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.2 RELATED REQUIREMENTS

A. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

B. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.3 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).

C. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 2021a, with Editorial Revision.

D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

PART 2 PRODUCTS

2.1 MATERIALS

A. Tile Carpeting, Type CPT2: Patterned Loop, manufactured in one color dye lot.
1. Product: Swell Collection, Colorcast Style as manufactured by Mannington Commercial.
2. Tile Size: 18 by 36 inch, nominal.
3. Color: As indicated on drawings.
4. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
5. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
6. Maximum Electrostatic Charge: 3 Kv. at 20 percent relative humidity.
7. Gauge: 5/64 inch.
8. Total Weight: 14 oz/sq yd.

B. Tile Carpeting, Type CPT3: Textured Patterned Loop, manufactured in one color dye lot.
1. Product: Exchange 2 Collection, Transmit Style as manufactured by Mannington Commercial.
2. Tile Size: 24 x 24 inch, nominal.
3. Pile Thickness: 0.113 inch.
4. Color: As indicated on drawings.
5. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
6. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
7. Smoke Density: Less than, or equal to, 450; in accordance with ASTM E662
8. Maximum Electrostatic Charge: 3 Kv. at 20 percent relative humidity.
9. Gauge: 5/64 inch.
10. Stitches: 10 per inch.
11. Total Weight: 21 oz/sq yd.

C. Tile Carpeting, Type CPT4: Tufted Textured Loop, manufactured in one color dye lot.
1. Product: Long Story Short as manufactured by Bentley Mills, Inc..
2. Tile Size: 24 x 24 inch, nominal.
3. Thickness: 0.365 inch.
4. Color: As indicated on drawings.
5. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with

ASTM E648 or NFPA 253.

6. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
7. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity.
8. Gauge: 1/12 inch.
9. Stitches: 10 per inch.
10. Total Weight: 84 oz/sq yd.

2.2 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Vinyl, color as selected by Architect.

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 090561.
   2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 097200
WALL COVERINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation and prime painting.

B. Wall covering.

1.2 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

B. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2020.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on wall covering and adhesive.

C. Shop Drawings: Indicate wall elevations with seaming layout.

D. Samples: Submit two samples of wall covering, 24 by 24 inch in size illustrating color, finish, and texture.

E. Test Reports: Indicate verification of flame and smoke ratings, when tested by UL.

F. Manufacturer's Installation Instructions: Indicate special procedures.

G. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

H. Manufacturer's Qualification Statement.

I. Installer's Qualification Statement.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Wall Covering Materials: 25 linear feet of each color and pattern of wall covering; store where directed.
   3. Package and label each roll by manufacturer, color and pattern, and destination room number.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.6 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.1 Wall Coverings

A. General Requirements:
1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.

B. Wall Covering - Type WC1: Fabric-backed vinyl roll stock.
1. Comply with ASTM F793/F793M, Category V, Type II.
2. Total Weight: 33 oz/lin. yd.
3. Roll Width: 52 inches.
4. Backing: Heavyweight PolyCotton Drill fabric.
5. Color: As indicated on drawings.
6. Pattern: As indicated on drawings.
7. Repeat: Random Match/Reverse Hang
8. Manufacturers:
   a. Arc|Com; www.arc-com.com.
   b. An approved equal.
   c. Substitutions: See Section 016000 - Product Requirements.

C. Wall Covering - Type WC2: Fabric-backed vinyl roll stock.
1. Comply with ASTM F793/F793M, Category V, Type II.
2. Total Weight: 13.33 oz/sq yd.
3. Roll Width: 54 inches.
4. Backing: Woven, osnaburg fabric.
5. Color: As indicated on drawings.
6. Pattern: As indicated on drawings.
7. Pattern Match: Random non-reversible
8. Manufacturers:

a. MDC Interior Solutions: www.mdcwall.com.
b. An approved equal.
c. Substitutions: See Section 016000 - Product Requirements.

D. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.

E. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

F. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work, and comply with requirements of wall covering manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.2 PREPARATION

A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

C. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

E. Vacuum clean surfaces free of loose particles.

3.3 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall surface immediately prior to application of wall covering.

C. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

D. Butt edges tightly.

E. Horizontal seams are not acceptable.

F. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

G. Install wall covering before installation of bases and items attached to or spaced slightly from

wall surface.

H. Cover spaces above and below windows, above doors, in pattern sequence from roll.

I. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.

J. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.4 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.5 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

SECTION 097800
METAL INTERIOR PANEL FINISH

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal interior panel finish for custom architectural wood casework.

1.2 Related Requirements

A. Section 064100 - Architectural Wood Casework: Substrate materials for metal interior panel finishes.

1.3 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's descriptive literature for each specified product. Include anchorage devices specific to project substrate types.

C. Shop Drawings: Submit elevations for each application and location. Indicate details of joints and attachments.

D. Samples: Submit two samples 12 by 12 inches in size, indicating finish, surface design, and color for each type of panels.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Panels: Quantity equal to 5 percent of total installed.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.

B. Installer Qualifications: Company specializing in installing work of the type specified in this section, and with at least three years of documented experience.

1.6 Delivery, Storage, and Handling

A. Deliver products to project site in manufacturer's original packaging, marked with manufacturer's product identification.

B. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Interior Wall Paneling:
1. Moz; www.mozdesigns.com
2. An approved equal
3. Substitutions: See Section 01 6000 - Product Requirements.

2.2 REGULATORY REQUIREMENTS

A. Surface Burning Classification: Provide wall paneling assemblies meeting Class A when tested in accordance with ASTM E84.

2.3 METAL INTERIOR WALL PANELING

A. Metal Wall Panel System:
1. Applications: As indicated on drawings.
2. Panel Size: As indicated on drawings.
3. Thickness: 0.040 inch.
4. Color and Finish: As indicated on drawings.
5. Substrate: As indicated on drawings.

B. Materials: Aluminum sheet.

C. Fabrication: Shop fabricate to greatest extent possible.

D. Adhesive: Type recommended by panel manufacturer.

E. Fasteners: Type recommended by panel manufacturer, match color and finish of panels.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill holes in panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to back side of panel using trowel recommended by adhesive manufacturer.

D. Apply panels to substrate with vertical joints plumb and horizontal joints level and pattern

aligned with adjoining panels.

E. Using a roller, apply pressure to panel face to ensure proper adhesion between surfaces.

F. Install panels with manufacturer's recommended gaps for panel field and corner joints.

G. Install panels with fasteners as recommended by manufacturer for conditions present.

H. Seal joints at wall base and between panels with approved sealant to prevent moisture intrusion.

I. Remove excess sealant after paneling is installed and prior to curing.

3.2 CLEANING

A. Clean panel faces using cleaning agents and methods recommended by manufacturer to remove soiling.

END OF SECTION

SECTION 098430
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.1 Section Includes

A. Sound-absorbing ceiling baffles.

B. Mounting accessories.

1.2 Reference Standards

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

C. ASTM E795 - Standard Practices for Mounting Test Specimens during Sound Absorption Tests; 2023.

1.3 Submittals

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, panel layout and fabric orientation.

D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available.

E. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.

F. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

G. Manufacturer's qualification statement.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Panels: Quantity equal to 5 percent of total installed, but not less than one of each type.

1.4 Quality Assurance

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least five years of documented experience.

1.5 Delivery, Storage, and Handling

A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

PART 2 PRODUCTS

2.1 Fabric-Covered Sound-Absorbing Units

A. Manufacturers:
1. DDS Acoustical Specialties; Signature S-2000 Ceiling Cloud; www.ddsacoustical.com.
DDS Acoustical Specialties
Westfield, MA
Phone: (413) 248-8118
Email: info@ddsacoustical.com
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

B. General:
1. Prefinished, factory assembled fabric-covered panels.
2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

C. Fabric-Covered Acoustical Ceiling Baffles:
1. Baffle Core: Manufacturer's standard rigid or semi-rigid fiberglass core.
2. Core Density: 6 to 7 lb/cu ft.
3. Sound Absorption: Noise Reduction Coefficient (NRC) of 0.85 when tested in accordance with ASTM C423 for Type J mounting, per ASTM E795.
4. Baffle Size: 48 inches by 120 inches, in total lengths as indicated on drawings.
5. Baffle Thickness: 1 and 2 inches as indicated on drawings.
6. Edges: Perimeter edges, fully wrapped with mounting, reinforced by a formulated resin hardener.
7. Corners: Square.
8. Fabric: Woven polyester.
9. Color: As selected by Architect from manufacturer's full range.
10. Mounting: Vertically suspended from ceiling or structure by one edge of panel.

2.2 Fabrication

A. Fabric Wrapped, General: Fabricate panels to sizes and configurations as indicated, with fabric facing installed without sagging, wrinkles, blisters, or visible seams.

B. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.3 Accessories

A. Ceiling-Suspended Accessories: Manufacturer's standard accessories at locations as indicated on each acoustical unit, sized appropriately for weight of acoustical unit.
1. Provide galvanized wire for suspension from ceiling at heights as indicated.

PART 3 EXECUTION

3.1 Installation

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Install mounting accessories and supports in accordance with shop drawings.

C. Suspend ceiling baffles at locations and heights as indicated.

D. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
1. Plumb and level.
2. Flatness.

3.2 Cleaning

A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.3 Protection

A. Provide protection of installed acoustical panels until Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope:
1. Paint exterior steel dunnage supporting chiller and associated exposed conduit and pipe.
2. Paint miscellaneous items associated with exterior repair or replacement work, as directed by the Architect.
3. Paint exterior doors and access doors.

D. Do Not Paint or Finish the Following Items:
1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
5. Non-metallic roofing and flashing.
6. Brick masonry.
7. Glass.
8. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting.

B. Section 099300 - Staining and Transparent Finishing

1.3 REFERENCE STANDARDS

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, submit each color in each sheen available.
   3. Allow 30 days for approval process, after receipt of complete samples by Architect.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 10 years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
   2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

C. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.

2.3 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed wood and primed metal.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Exterior Alkyd Enamel; MPI #9, 81, 94, or 96.
   3. Primer: As recommended by top coat manufacturer for specific substrate.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

G. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

H. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

I. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks

after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

END OF SECTION

SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Shop-primed items.

B. Section 055100 - Metal Stairs: Shop-primed items.

C. Section 099113 - Exterior Painting.

D. Section 099300 - Staining and Transparent Finishing

1.3 REFERENCE STANDARDS

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current

Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
2. MPI product number (e.g., MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, submit each color in each sheen available.
3. Allow 30 days for approval process, after receipt of complete samples by Architect.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 10 years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature

ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. Supply each paint material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.3 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, wood, uncoated steel, shop primed steel, and galvanized steel.
1. Two top coats and one coat primer.
2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, 141, or 142.

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
2. Two top coats and one coat primer.
3. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

F. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

G. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

H. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots,

pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

I. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

END OF SECTION

SECTION 099300
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of stains and transparent finishes.

1.2 REFERENCE STANDARDS

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category.

C. Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on actual wood substrate to be finished, 12 x 12 inch in size.

D. Manufacturer's Qualification Statement.

E. Applicator's Qualification Statement.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 10 years experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide finishes used in any individual system from the same manufacturer; no exceptions.

2.2 Stains and Transparent FINISHES - GENERAL

A. Finishes:
1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
4. Supply each finish material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

C. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.

2.3 Exterior STAIN AND TRANSPARENT FINISH SYSTEMS

A. Finish on Wood - Trim:
1. 2 coat(s) varnish over 1 coat(s) stain.

2. Stain: Exterior Solid Stain for Wood, Water Based; MPI #16.
3. Top Coat(s): Exterior Clear Alkyd Varnish with UV Inhibitor.
4. Top Coat Sheen:
   a. Satin: MPI gloss level 4; use this sheen at all locations.

2.4 Interior STAIN AND TRANSPARENT FINISH SYSTEMS

A. Finish on Wood - Trim:
1. 2 coat(s) varnish over 1 coat(s) stain.
2. Stain: Semi-Transparent Stain for Wood, Water Based; MPI #186.
3. Top Coat(s): Clear Water-Based Varnish; MPI #128, 129, or 130.
4. Top Coat Sheen:
   a. Satin: MPI gloss level 4; use this sheen at all locations.

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.

B. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of stains and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

E. Reinstall items removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

END OF SECTION

SECTION 101423
PANEL SIGNAGE

PART 1 GENERAL

1.1 Section Includes

A. Panel signage.

1.2 Reference Standards

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.3 Submittals

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
   2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
      a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
      b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
      c. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.

E. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.

F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

G. Manufacturer's qualification statement.

1.4 Quality Assurance

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5 Delivery, Storage, and Handling

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.6 Field Conditions

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.1 Manufacturers

A. Panel Signage:
1. Best Sign Systems, Inc: www.bestsigns.com.
2. FASTSIGNS International, Inc: www.fastsigns.com.
3. Inpro Corporation: www.inprocorp.com.
4. Mohawk Sign Systems, Inc: www.mohawksign.com.
5. Seton Identification Products: www.seton.com/aec.
6. Takeform: www.takeform.net.
7. Vista System LLC: www.vistasystem.com.
8. An approved equal.
9. Substitutions: See Section 016000 - Product Requirements.

2.2 Regulatory Requirements

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.3 Panel Signage

A. Panel Signage:
1. Application: Room and door signs.
2. Description: Flat signs with injection molded panel media, tactile characters.
3. Sign Size: 4 inches by 6 inches.
4. Total Thickness: 1/8 inch.
5. Sign Edges: Squared.
6. Letter Edges: Squared.
7. Corners: Radiused.
8. Color and Font, unless otherwise indicated:
   a. Character Font: Helvetica, Arial, or other sans serif font.

b. Character Case: Upper and lower case (title case).
c. Background Color: As scheduled.
d. Character Color: Contrasting color.

9. Material: One-piece injection molded acrylic plastic with raised letters and braille.
10. Profile: Flat panel without frame.
11. Tactile Letters: Raised 1/32 inch minimum.
12. Braille: Grade II, ADA-compliant.
13. One-Sided Wall Mounting: Tape adhesive.

2.4 SIGNAGE APPLICATIONS

A. Room and Door Signs:
1. Office Doors: Identify with room names and numbers to be determined later, not those indicated on drawings; provide "window" section for replaceable occupant name.
2. Conference and Meeting Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings; provide "window" section with sliding "In Use/Vacant" indicator.
3. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
4. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", and braille.

2.5 Accessories

A. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 Examination

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.2 Installation

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

END OF SECTION

SECTION 102239
FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Top-supported folding panel partitions, horizontal opening, electrically operated.

B. Top-supported folding panel partitions, horizontal opening, manually operated.

C. Top-supported operable panel partitions, horizontal opening, manually operated.

1.2 RELATED REQUIREMENTS

A. Section 061053 - Miscellaneous Rough Carpentry: Wood blocking and track support shimming.

B. Section 088000 - Glazing: Glazing to be field installed.

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections; control buttons .

1.3 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

E. ASTM E413 - Classification for Rating Sound Insulation; 2022.

F. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions; 2012 (Reapproved 2020).

G. ASTM E596 - Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures; 2022.

H. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2020.

I. NEMA MG 1 - Motors and Generators; 2021.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled

beginning of construction activities of this section to review section requirements.

1. Require attendance by representatives of installer.
2. Notify Architect four calendar days in advance of scheduled meeting date.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.

C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, adjacent construction and finish trim, stacking depth, and size and locations of window openings, and glazing thickness accommodated.

D. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

E. Samples for Review: Submit two samples of surface finish, 12 by 12 inches size, illustrating quality, colors selected, texture, and weight.

F. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.

G. Manufacturer's Instructions: Indicate special procedures.

H. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within five year period after Date of Substantial Completion.

C. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Folding Panel Partitions - Horizontal Opening:
1. Modernfold, a DORMA Group Company; Acousti-Seal Legacy: www.modernfold.com.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

B. Operable Panel Partitions - Horizontal Opening:
1. Hawa Sliding Solutions AG; Hawa Aperto 60 H; www.hawa.com.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

2.2 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING - ELECTRICALLY OPERATED

A. Basis of Design: Acousti-Seal Legacy Electric #933E

B. Folding Panel Partitions: Side opening; continuous hinged panels; side stacking; motor operated.

C. Panel Construction:
1. Frame: 16 gauge, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
2. Panel Substrate Facing: Steel sheet, 16 gauge, 0.0598 inch thickness.
3. Hinges: Continuous piano type, stainless steel.
4. Hardware: Latching door handles of cast steel, satin chrome finish; lock cylinder keyed to building keying system; pull bars.
5. Panel Properties:
a. Thickness With Finish: 3 inches, nominal.
b. Width: Up to 48 inches (1219 mm).
c. Weight: 11 lb/sq ft.

D. Panel Finishes:
1. Facing: Vinyl coated fabric, as indicated on drawings.

E. Panel Seals:
1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
2. Acoustic Seals, Top: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.
3. Acoutsic Seals, Bottom: Automatic operable seals providing nominal 2 inch operating clearance with an operating range of + 1/2 inch to - 1-1/2 inch which automatically drop as panels are posititioned, without the need for tools or cranks.

F. Suspension System:
1. Track: Extrudes structural aluminum; size, thickness, and profile designed to support

loads. Track shall be supported by adjustable steel hanger brackets connected to structural support by pairs of 3/8 inch diameter threaded rods.

a. Exposed track soffit: Track soffit to be integral to track shape and shall be powder-coated off white paint finish. Track must accommodate termination of plenum sound barriers on both sides of track for maximum sound control.

2. Carriers: Nylon wheels on trolley carrier at top of every second panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.

G. Performance:

1. Acoustic Performance:
   a. Noise Reduction Coefficient (NRC): ASTM E596, NRC of 0.65 minimum.
   b. Sound Transmission Class (STC): 52 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
2. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

H. Operation:

1. Electric Operator: 6 inches per second traveling speed; adjustable friction clutch brake actuated by solenoid controlled motor starter; enclosed limit switch; enclosed magnetic reversing starter.
   a. Motor: NEMA MG 1 Service Factor.
2. Control Station: Two push button control stations, wired in series, and located on opposite sides and opposite ends of the partition. Control stations shall be activated by key switch at stack end of partition. Push button control station shall have OPEN-STOP-CLOSE positions; 24 volt circuit; surface mounted.
   a. Key switch prepared for mortise lock cylinder.
   b. Key switches alike.
3. Safety Features:
   a. Limit Switches: Automatic type, at both extremes of travel, to prevent over-travel.
   b. Emergency Release: Mechanism to disengage motor drive system and permit manual operation.
   c. Pocket Door Interlock: Mechanism to prevent operation of panels unless storage pocket doors are fully open.
   d. Safety Mats - Located at panel storage area. Personnel sensing switch mat shall activate with the presene of a minimum 22 lb. obstruction in the stack areas and prevent panels from stacking until the personnel/obstruction is removed. Mats shall be provided with 4-lead fail-safe wiring.
   e. Motion Sensors - PIR/Microwave Detector - Wall or ceiling mounted motion sensors covering the travel area of the automated partition shall automatically sto p the movement of the panels in the presence of unauthorized movement or obstruction. Detector can detect motion in an area up to 300 feet long by 7-1/2 feet wide and 10 feet high.
4. Final Closure:
   a. Side Jamb with overlapping trail pane3l with "Modernfold Presto Automation Package"
5. Electrical Requirements:
   a. 115 volts, single phase, 60 Hz.

I. FOLDING PANEL PARTITIONS - HORIZONTAL OPENING - MANUALLY OPERATED

1. Basis of Design: Acousti-Seal Legacy Paired Panel #932
2. Folding Panel Partitions: Center opening; paired panels; side stacking; manually operated.
3. Panel Construction:
   a. Frame: 16 gauge, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
   b. Panel Substrate Facing: Steel sheet, 21 gauge, 0.032 inch thickness.
   c. Hinges: Continuous piano type, stainless steel.
   d. Panel Properties:
      1) Thickness With Finish: 3 inches, nominal.
      2) Width: Up to 48 inches (1219 mm).
      3) Weight: 8.2 lb/sq ft.
4. Panel Finishes:
   a. Facing: Vinyl coated fabric, as indicated on drawings.
5. Panel Seals:
   a. Acoustic Seals, Top: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.
   b. Acoutsic Seals, Bottom: Manually activated seals providing nominal 2 inch operating clearance with an operating range of + 1/2 inch to - 1-1/2 inch. Seals shall be operable from panel edge or face. Extended seall shall exert nominal 120 pounds downward force to the floor throughout operating range.
   c. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
6. Suspension System:
   a. Track: Minnimum 11 gauge, 0.12 inch roll-formed steel track, suitable for either direct mounting to a wood hearder or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 3/8 inch diameter threaded rods. Aluminum track is not acceptable.
      1) Exposed track soffit: Steel, integral to track, and pre-paainted off-white.
   b. Carriers: Steel, ball bearing wheels on trolley carrier at top of every panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.
7. Performance:
   a. Acoustic Performance:
      1) Noise Reduction Coefficient (NRC): ASTM E596, NRC of 0.65 minimum.
      2) Sound Transmission Class (STC): 52 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
   b. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.
8. Operation: Manual operation

J. Accessories:
1. Acoustic Sealant: As recommended by partition manufacturer.

2.3 OPERABLE PANEL PARTITIONS - HORIZONTAL OPENING

A. Basis of Design: Hawa Sliding Solutions AG; Hawa Aperto 60 H.

B. Operable Panel Partition: Horizontal opening; individual panels stacked in parallel and 90 degree parking areas as indicated on plans; manually operated.

C. Panel Construction:
1. Frame: 16 gauge, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction.
2. Substrate: Medium-density fiberboard.
3. Panel Properties:
a. Thickness With Finish: 1-3/4 inches.
b. Height: As indicated on drawings

D. Panel Finishes:
1. Facing: Vinyl coated fabric, as indicated on drawings.

E. Panel Seals:
1. Panel to Panel Seals: Tongue and groove configuration, color to match panel finish.

F. Suspension System:
1. Top Guide Rails: Extruded aluminum; nominal 2 inches wide by 2 inches deep.
2. Bottom Guide Rails: Extruded aluminum; nominal 5/8 inches wide by 5/8 inches deep, recessed into floor slab.
3. Guide Rollers: Sealed rollers with hardened steel ball bearings.

G. Performance:
1. Surface Burning Characteristics of Panel Finish: Flame spread/smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
2. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

H. Operation: Manual

2.4 MATERIALS

A. Aluminum Extrusions: ASTM B221, 6063 alloy, T6 temper.

B. Vinyl Coated Fabric: ASTM F793 Category VI, polyvinyl fluoride (PVC) finish for washability and improved flame retardance; color as selected by Architect from manufacturer's standard range.

C. Particleboard: ANSI A208.1; composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

D. Acoustic Insulation:
1. Type: As required for acoustic performance indicated.
2. Thickness: As required for acoustic performance indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify that required utilities are available, of the correct characteristics, in proper location, and ready for use.

C. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.

D. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

E. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

3.2 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557.

B. Install electric operator, wiring, and controls. Locate control station(s) as directed.

C. Fit and align partition assembly level and plumb.

D. Lubricate moving components.

E. Install acoustic sealant to achieve required acoustic performance.

F. Coordinate electrical connections.

3.3 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.

B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.

C. Adjust partition assembly to achieve lightproof seal.

3.4 CLEANING

A. Clean finish surfaces and partition accessories.

3.5 CLOSEOUT ACTIVITIES

A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION

SECTION 102310
GLAZED INTERIOR WALL AND DOOR ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Framed glazed interior wall and door assemblies.

1.2 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

1.3 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1036 - Standard Specification for Flat Glass; 2021.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

G. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

H. ASTM E413 - Classification for Rating Sound Insulation; 2022.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
   1. Require attendance by representatives of installer and other entities directly affecting, or affected by, construction activities of this section.
   2. Notify Architect four calendar days in advance of scheduled meeting date.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for each component in partition assembly.

C. Shop Drawings: Drawings showing layout, dimensions, identification of components, and interface with adjacent construction.
   1. Include field measurements of openings.
   2. Include Elevations Showing:
      a. Locations and identification of manufacturer-supplied door hardware and fittings.
      b. Locations and sizes of cut-outs and drilled holes for other door hardware.
   3. Include Details Showing:
      a. Requirements for support and bracing.
      b. Installation details.
      c. Appearance of manufacturer-supplied door hardware and fittings.

D. Selection Samples: Two sets, representing manufacturer's full range of available metal materials and finishes.

E. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.

F. Certificates: Contractor to certify that installer of partition assemblies meets specified qualifications.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

H. Specimen Warranty.

I. Fabricator's Qualification Statement.

J. Manufacturer's Qualification Statement.

K. Installer's Qualification Statement.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Minimum three years of experience designing, assembling, and installing partition assemblies similar to those specified in this section.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against excessive degradation of metal finishes. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 BASIS OF DESIGN - FRAMED GLAZED INTERIOR WALL AND DOOR ASSEMBLIES

A. Basis of Design: Metrowall; DG Series Framed Assembly; www.Metro-wall.com.

B. Substitutions: See Section 016000 - Product Requirements.
1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.2 PERFORMANCE REQUIREMENTS

A. Acoustical Performance: Provide glass partitions and door assemblies tested by qualified testing agency, calculated in accordance with ASTM E413, tested in accordance with ASTM E90, and rated for not less than Sound Transmission Class (STC) indicated.
1. Partition and Door STC Rating: 40, minimum, for framed partition and swinging door.

2.3 FRAMED GLAZED INTERIOR WALL AND DOOR ASSEMBLIES

A. Framed Glazed Interior Wall Assembly: Factory fabricated assemblies consisting of perimeter channel frames, butt-glazed dry joints and framed joints between panels.
1. Configuration: As indicated on drawings.
2. Head Channel Frame: nominal 3 inch wide by 2 inch deep.
3. Jamb Channel Frame: nominal 3 inch wide by 2 inch deep.
4. Sill Dri-Fit Channel Frame: nominal 3 inch wide by 2 inch deep.
5. Surface mounted to face of wall as indicated on drawings.
6. Frame Finish: Pigmented organic coatings.
7. Perimeter Anchors: Aluminum.
8. Coordinate wall and door assembly preparation and provide hardware as necessary for fully operable installation.
9. Design system to withstand normal operation without damage, racking, sagging, or deflection.
10. Factory assembled to greatest extent practical; may be disassembled to accommodate shipping constraints.

B. Pivoting Glass Doors: Patch fittings at head and sill on pivot side and at lock and strike on swing side.
1. Door Configuration: As indicated on drawings.
2. Glass Thickness: 1/2 inch, tempered.
3. Fittings Finish: To match frame finish.
4. Door Hardware: Refer to the Section 087100.
5. Provide accessories as required for complete installation.

2.4 MATERIALS

A. Glass: Flat glass meeting requirements of ASTM C1036, Type I - Transparent Flat Glass, Class 1 - Clear, Quality Q3, fully tempered in accordance with ASTM C1048, Kind FT, and as follows:
   1. Thickness: 1/2 inch.
   2. Prepare glazing panels for indicated fittings and hardware before tempering.
   3. Polish edges that will be exposed in finished work to bright flat polish.
   4. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.

B. Aluminum Components: Complying with ASTM B221 (ASTM B221M), alloy 6063, T5 temper.

C. Sealant: One-part silicone sealant, complying with ASTM C920, clear.

2.5 FINISHES

A. Pigmented Organic Coatings: AAMA 2603; polyester or acrylic baked enamel finish.

B. Color: To be selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

C. Do not begin installation until supports and adjacent substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

A. Install in accordance with glazed interior wall and door assembly manufacturer's instructions.

B. Fit and align glazed interior wall and door assembly level and plumb.

3.3 ADJUSTING

A. Adjust glazed interior wall and door assembly to operate smoothly from pivoting positions.

B. Adjust swing door hardware for smooth operation.

3.4 CLEANING

A. Remove protective film from exposed metal surfaces.

B. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents or other substances that may damage the material or finish.

C. Glass and Glazing: Clean glazing surfaces; remove excess glazing sealant compounds, dirt, and other substances.

END OF SECTION

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Under-lavatory pipe supply covers.

D. Diaper changing stations.

E. Utility room accessories.

1.2 RELATED REQUIREMENTS

A. Section 061053 - Miscellaneous Rough Carpentry: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.

1.3 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2022.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

E. ASTM C1036 - Standard Specification for Flat Glass; 2021.

F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement and concealed ceiling supports to receive anchor attachments.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories: As indicated on drawings.
1. American Specialties, Inc: www.americanspecialties.com.
2. Bobrick Washroom Accessories: www.bobrick.com
3. An approved equal.
4. Substitutions: Section 016000 - Product Requirements.

B. Under-Lavatory Pipe Supply Covers:
1. Plumberex Specialty Products, Inc: www.plumberex.com.
2. An approved equal.
3. Substitutions: Section 016000 - Product Requirements.

C. Diaper Changing Stations:
1. American Specialties, Inc; Model 9013: www.americanspecialties.com.
2. An approved equal.
3. Substitutions: 016000 - Product Requirements.

D. Provide products of each category type by single manufacturer.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

C. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.

2.4 Commercial Toilet Accessories - See Toilet Room Accessory Schedule on Drawings.

A. Toilet Paper Dispenser: Double roll, recessed, stainless steel unit with pivot hinge, tumbler lock.
   1. Products:
      a. Bobrick; Model B3888.

B. Combination Towel Dispenser/Waste Receptacle: Recessed flush with wall, stainless steel; seamless wall flanges, continuous piano hinges, tumbler locks on upper and lower doors.
   1. Waste receptacle liner: Reusable, heavy-duty vinyl.
   2. Towel dispenser capacity: 700 multifold.
   3. Waste receptacle capacity: 12 gallons.
   4. Products:
      a. American Specialties, Inc; Model #0469: www.americanspecialties.com.

C. Automated Soap Dispenser: Liquid soap dispenser, wall-mounted, with stainless steel cover and window to gauge soap level, tumbler lock.
   1. Minimum Capacity: 48 ounces.

D. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Size: As scheduled.
   3. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
   4. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
   5. Products:
      a. Bobrick, Model B293.

E. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
   1. Minimum capacity: 250 seat covers.
   2. Products:
      a. Bobrick; Model B221.

F. Grab Bars: Stainless steel, smooth surface.

1. Standard Duty Grab Bars:
   a. Push/Pull Point Load: 250 pound-force, minimum.
   b. Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
   c. Finish: Satin.
   d. Length and Configuration: As indicated on drawings.
   e. Products:
      1) Bobrick; Model B-5806.

G. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Products:
   a. Bobrick; Model B354.

H. Sanitary Napkin Disposal Unit: Stainless steel, recessed, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Products:
   a. Bobrick; Model B353.

2.5 Commercial Shower and Bath Accessories

A. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
1. Products:
   a. American Specialties; Model 0714.

2.6 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible PVC.
   a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
4. Color: White.
5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.

2.7 Diaper Changing Stations

A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
1. Material: Polyethylene.
2. Mounting: Surface.
3. Color: Gray.

2.8 Utility Room Accessories

A. Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
1. Holders: Three spring-loaded rubber cam holders.
2. Length: 36 inches.
3. Products:
a. Bobrick; Model B223.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. See Section 061053 - Miscellaneous Rough Carpentry for installation of blocking in walls.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.2 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and installation instructions.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Extinguishers:
   1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com.
   2. An approved equal.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series: www.activarcpg.com.
   2. An approved equal.

3. Substitutions: See Section 016000 - Product Requirements.

2.2 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
1. Class: A:B:C type.
2. Size: 2.5 pound.
3. Finish: Baked polyester powder coat, red color.
4. Temperature range: Minus 40 degrees F to ___ degrees F.

2.3 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.
1. Formed primed steel sheet; 0.036 inch thick base metal.

C. Fire Rated Cabinet Construction: One-hour fire rated.
1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.

D. Cabinet Configuration: Recessed type.
1. Trim: Flat square edge, with 1 inch wide face.

E. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.

F. Door Glazing: Polycarbonate plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

H. Fabrication: Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

J. Finish of Cabinet Interior: White colored enamel.

2.4 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 24 inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets and on wall brackets.

END OF SECTION

SECTION 108213
EXTERIOR GRILLES AND SCREENS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior aluminum screens attached to structure.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Mounting substrates.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

F. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2022.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Submit detailed shop drawings, indicating component profiles, sections, finishes, fastening details, special details, and manufacturer's technical and descriptive data.

C. Samples: Submit samples for color verification, 10 inches by 10 inches minimum.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer's original, unopened packaging, with labels clearly identifying manufacturer and material.

B. Store materials indoors, protected from moisture, humidity, and extreme temperature fluctuations.

1.7 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Exterior Metal Grilles and Screens:
1. Deep Stream Design; www.deepstreamdesign.com.
2. An approved equal.
3. Substitutions: See Section 016000 - Product Requirements.

2.2 SCREENS

A. Aluminum Screens: Provide shop fabricated, shop finished screens assembled into panels.
1. Screen Type: Laser-cut metal sheet.
a. Pattern: As detailed on drawings.
b. Panel Depth: As detailed on drawings.
2. Panel Size and Configuration: As indicated on drawings.
3. Frame/Support: Extruded aluminum tube or flat aluminum bar.

2.3 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M) alloy 6063, temper T5, 1/8 inch minimum wall thickness.

B. Aluminum Sheet: ASTM B209/B209M alloy 5005, with temper as required for forming.

2.4 FABRICATION

A. Shop fabricate grilles and screens to the greatest extent possible.

B. Disassemble as necessary for shipping and handling, clearly mark units for proper reassembly.

C. Provide supports, anchorages, and accessories as required for complete assembled system.

D. Provide inserts as required for installation into concrete or masonry based support materials.

2.5 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

B. Finish Color: As selected by Architect from manufacturer's standard color range.

2.6 ACCESSORIES

A. Fasteners: ASTM F593 stainless steel or ASTM A307 carbon steel, sizes to suit installation conditions.

B. Anchors and Inserts: Corrosion resistant; type, size, and material required for loading and installation as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that painting, roofing, masonry work, and other adjacent work that might damage grille finish have been completed prior to start of installation.

C. Verify that anchorage devices have been properly installed and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written installation instructions.

B. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint, and allow paint to dry prior to installation of aluminum components.

C. Set screenss level, plumb, with uniform joints, and in alignment with adjacent work as indicated.

D. Mechanically secure screens to supporting structure.

E. Do not cut or trim aluminum members without approval of manufacturer; do not install damaged members.

3.3 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch.

B. Maximum Offset From True Alignment: 1/8 inch.

3.4 CLEANING

A. Clean finished surfaces as recommended by manufacturer and maintain clean condition until Date of Substantial Completion.

B. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

END OF SECTION

SECTION 115213
PROJECTION SCREENS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Front projection screen assemblies.

1.2 RELATED REQUIREMENTS

A. Section 061053 - Miscellaneous Rough Carpentry: Wood blocking in walls, ceilings, and soffits.

B. Section 260583 - Wiring Connections: Electrical supply, conduit, and wiring for electric motor operated projection screens.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Wiring diagrams for motor operators and actuators, and controls and switches.

C. Samples: For screen fabrics, submit two samples 6 by 6 inch in size.

D. Samples: For case and frame finishes, submit two samples 6 by 6 inch in size, illustrating color and texture of finish.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver projection screens to project site in manufacturer's original unopened packaging, and inspect for damage and proper size before accepting delivery.

B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F, and stack in accordance with manufacturer's recommendations.

C. Acclimate screens to building temperatures for 24 hours prior to installation, in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.1 FRONT PROJECTION SCREENS

A. Manufacturers:
1. Da-Lite Screen Company: www.da-lite.com.
2. An approved equal
3. Substitutions: See Section 016000 - Product Requirements.

B. Front Projection Screens: Factory assembled unless otherwise indicated.
1. Located in Community Room II: Motorized, matte light diffusing fabric screen, horizontally tensioned, wall mounted.
   a. Screen Viewing Area: ___ inch high by ___ inch wide.
   b. Screen Dimensions: ___ inch high by ___ inch wide.

C. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant and mildew resistant.
1. Material: Matte white vinyl on fiberglass backing, with nominal gain of 1.0 over viewing angle not less than 70 degrees from axis, horizontally and vertically.
2. Seams: No seams permitted in fabric up to 96 inch high by 72 inch wide.

D. Exposed Screen Cases: Steel, with integral roller brackets.
1. Finish: Baked enamel.
2. Color: White.
3. End Caps: Steel; finished to match case.
4. Mounting: Wall.

E. Electrically-Operated Screens:
1. Roller: Steel, 2 inch in diameter, with locking device.
2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar and plastic end caps.
3. Horizontal Tensioning: Tab-guided cable system.

F. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.2 ELECTRICAL COMPONENTS

A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.

B. Motors: Direct drive, 110 V, 60 Hz.
1. Screen Motor: Mounted inside roller; three wire with ground; quick reverse type,

lifetime lubricated, and _____; equipped with thermal overload cut-off, internal junction box, electric brake, pre-set accessible limit switches, and _____.

a. Electrical Characteristics: 1.2 amps.
b. Motor mounted on sound absorber.

C. Controls: Three (3) position control switch with plate.
1. Provide two control stations to screen, with internal override to prevent more than one signal reaching the screen.
2. Remote Control: Infrared; provide one transmitter.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate is finished and ready to accept screen installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify type and location of electrical connections.

D. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.2 PREPARATION

A. Coordinate screen installation with installation of projection systems.

B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.

B. Do not field cut screens.

C. Install screens in mountings as specified and as indicated on drawings.

D. Install plumb and level.

E. Install electrically operated screens ready for connection to power and control systems by others.

F. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.

G. Test electrical screens for proper working condition. Adjust as needed.

END OF SECTION

SECTION 122400
WINDOW SHADES - ROLLEASE ACMEDA CONTRACT

PART 1 GENERAL

1.1 Section Includes

A. Interior roller shades.

B. Shade fabric.

C. Motor controls and accessories.

1.2 Related Requirements

A. Section 061053 - Miscellaneous Rough Carp: Concealed wood blocking for attachment of headrail brackets.

1.3 Reference Standards

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

B. ASTM E795 - Standard Practices for Mounting Test Specimens during Sound Absorption Tests; 2023.

C. CPSC-2022-25041/87 FR 73144 - Safety of Window Coverings Product; 2023.

D. NFPA 70-2017 - National Electrical Code; 2017.

E. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

F. OEKO-TEX: STANDARD 100 - STANDARD 100 by OEKO-TEX; 2022.

G. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.4 Administrative Requirements

A. Coordination:
   1. Coordinate work with other trades to provide rough-in of electrical wiring for hardwired motorized shade installation.

B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

C. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening are taken with field conditions in place.

2. Do not install shades until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
1. Motorized Shades: Include power requirements and standard wiring diagrams for specified products.

C. Shop Drawings: Include shade schedule indicating size, location, and keys to details, head, jamb, and sill details, mounting dimension requirements for each product and condition, and direction of operation.
1. Motorized Shades: Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.

D. Samples:
1. For Verification: Minimum size 6 inches square, representing actual materials, color, and pattern.

E. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Manufacturer's qualification statement.

H. Fabricator's qualification statement.

I. Installer's qualification statement.

1.6 Quality Assurance

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least ten years of documented experience.

B. Fabricator Qualifications: Company specializing in fabricating products specified in this section, with at least ten years of documented experience.

C. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience with shading systems of similar size and type.
1. Manufacturer's authorized representative.

1.7 Delivery, Storage, And Handling

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.8 Field Conditions

A. Ambient Conditions: Install roller shades after finish work, including painting, is complete and ambient temperature and humidity conditions are maintained at levels indicated for Project when occupied for its intended use.

1.9 Warranty

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Special Warranty: Provide manufacturer's warranty from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer. Cover the following:
1. Shade Hardware: Lifetime limited warranty.
2. AC and DC Wired Motors: Seven years.
3. Motorization Accessories: Seven years.
4. Fabric: Ten years.
5. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.1 Manufacturers

A. Basis of Design: Rollease Acmeda Contract; www.rolleaseacmedacontract.com/#sle.

B. Other Acceptable Manufacturers:
1. An approved equal.

C. Substitutions: See Section 016000 - Product Requirements.
1. Products other than basis of design are subject to compliance with specified requirements. By using products other than basis of design, Contractor accepts responsibility for costs associated with necessary modifications to related work, including design fees.

2.2 Roller Shades

A. General:
1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
2. Provide shade system that operates smoothly when shades are raised or lowered.
3. Motorized Shades: Motor system housed inside roller tube, controlling shade movement via motor controls indicated; listed or recognized to UL 325.
a. Comply with NFPA 70-2017.
b. Electrical Components: Listed, classified, and labeled as suitable for purpose intended. Use FCC-compliant system components where applicable.
c. Motors: Size and configuration as recommended by manufacturer for type, size, and arrangement of operating shades; integrated into shade operating components and concealed from view; fully compatible with installed controls.
4. Performance Requirements:
a. Operating Cord Safety: Comply with requirements of CPSC-2022-25041/87 FR

73144 regarding operating cords on custom window coverings.

B. Interior Roller Shades Type A: Rollease Acmeda Contract Series; Easy Spring Wand: www.rolleaseacmedacontract.com.
   1. Description: Double roller, manually operated fabric window shade system with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete installation.
      a. Drop Position: Regular roll.
      b. Mounting: Ceiling mounted, inside, from wall to wall.
      c. Size: As indicated on drawings.
      d. Fabric: As indicated under Shade Fabric article.
   2. Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
      a. Hardware Type: Mounting end caps with fascia.
         1) Color: White.
      b. Double Roller Mounting: Configured for light-filtering and room-darkening shades in one opening.
         1) Light-Filtering Fabric: Room-side of opening.
         2) Room-Darkening Fabric: Glass-side of opening.
   3. Multiple Shade Operation: Provide hardware as necessary to operate more than one shade using single operator.
   4. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.
      a. Material: Extruded aluminum, with wall thickness and material selected by manufacturer.
      b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
      c. Fabric Attachment: LSE (Low Stress Energy) double-sided adhesive tape to secure the fabric without having to remove shade roller from shade brackets. Adhesive attachement affords minor lateral adjustments to edge clearance dimensions.
         1) Fabric wrap of 2-1/2 to 3 times the circumference of the roller tube required for proper tension of fabric-to-tube.
      d. Roller tubes capable of being removed and reinstalled without affecting roller shade limit adjustments.
   5. Hembars: Designed to maintain bottom of shade straight and flat; selected from manufacturer's standard options.
      a. Style: Exposed hembar; D30 aluminum rectangular hembar with plastic end caps and integral brush light seal.
   6. Manual Operation: Spring assist.
      a. Shade Lift Assistance: Manufacturer's standard spring device contained in idler end of roller tube to reduce force required to lift shades; as required based on shade weight.
   7. Accessories:
      a. Light Gap Reduction Channels: Provide extruded aluminum channels to reduce light leakage at sides of shades.
      b. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to mounting end caps, without exposed fasteners; powder-coated finish.
         1) Color: White.

c. End Cap Covers: Match fascia finish.
d. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

C. Interior Roller Shades Type B: Rollease Acmeda Contract Series; Easy Spring Wand: www.rolleaseacmedacontract.com.
1. Description: Single roller, manually operated fabric window shade system with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete installation.
a. Drop Position: Regular roll.
b. Mounting: Ceiling mounted, inside, from wall to wall.
c. Size: As indicated on drawings.
d. Fabric: As indicated under Shade Fabric article.
2. Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
a. Hardware Type: Mounting end caps with fascia.
1) Color: White.
3. Multiple Shade Operation: Provide hardware as necessary to operate more than one shade using single operator.
4. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.
a. Material: Extruded aluminum, with wall thickness and material selected by manufacturer.
b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
c. Fabric Attachment: LSE (Low Stress Energy) double-sided adhesive tape to secure the fabric without having to remove shade roller from shade brackets. Adhesive attachement affords minor lateral adjustments to edge clearance dimensions.
1) Fabric wrap of 2-1/2 to 3 times the circumference of the roller tube required for proper tension of fabric-to-tube.
d. Roller tubes capable of being removed and reinstalled without affecting roller shade limit adjustments.
5. Hembars: Designed to maintain bottom of shade straight and flat; selected from manufacturer's standard options.
a. Style: Exposed hembar; D30 aluminum rectangular hembar with plastic end caps and integral brush light seal.
6. Manual Operation: Spring assist.
a. Shade Lift Assistance: Manufacturer's standard spring device contained in idler end of roller tube to reduce force required to lift shades; as required based on shade weight.
7. Accessories:
a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to mounting end caps, without exposed fasteners; powder-coated finish.
1) Color: White.
b. End Cap Covers: Match fascia finish.
c. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

D. Interior Roller Shades Type C: Rollease Acmeda Contract Series; Medium Fascia Dual Roller Shade: www.rolleaseacmedacontract.com.
1. Description: Double roller, motor-operated fabric window shade system with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete

installation.

a. Drop Position: Regular roll.
b. Mounting: Ceiling mounted, inside, from wall to wall.
c. Size: As indicated on drawings.
d. Fabric: As indicated under Shade Fabric article.

2. Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   a. Hardware Type: Mounting end caps with fascia.
      1) Color: White.
   b. Double Roller Mounting: Configured for light-filtering and room-darkening shades in one opening.
      1) Light-Filtering Fabric: Room-side of opening.
      2) Room-Darkening Fabric: Glass-side of opening.
3. Multiple Shade Operation: Provide hardware as necessary to operate more than one shade using single operator.
4. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.
   a. Material: Extruded aluminum, with wall thickness and material selected by manufacturer.
   b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
   c. Fabric Attachment: LSE (Low Stress Energy) double-sided adhesive tape to secure the fabric without having to remove shade roller from shade brackets. Adhesive attachement affords minor lateral adjustments to edge clearance dimensions.
      1) Fabric wrap of 2-1/2 to 3 times the circumference of the roller tube required for proper tension of fabric-to-tube.
   d. Roller tubes capable of being removed and reinstalled without affecting roller shade limit adjustments.
5. Hembars: Designed to maintain bottom of shade straight and flat; selected from manufacturer's standard options.
   a. Style: Exposed hembar; D30 aluminum rectangular hembar with plastic end caps and integral brush light seal.
6. Shade Motor: Mechanical limit, quiet 120 VAC motor, sound level of 44 dBA or less, located as indicated on drawings.
7. Idler Assembly: Molded nylon with adjustable length idler pin or spring-loaded idler to facilitate easy installation and removal of shade for service.
8. Accessories:
   a. Light Gap Reduction Channels: Provide extruded aluminum channels to reduce light leakage at sides of shades.
   b. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to mounting end caps, without exposed fasteners; powder-coated finish.
      1) Color: White.
   c. End Cap Covers: Match fascia finish.
   d. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

E. Interior Roller Shades Type D: Rollease Acmeda Contract Series; Medium Fascia Roller Shade: www.rolleaseacmedacontract.com.
   1. Description: Single roller, motor-operated fabric window shade system with mounting brackets, roller tubes, hembars, hardware, and other components necessary for complete

installation.
a. Drop Position: Regular roll.
b. Mounting: Ceiling mounted, inside, from wall to wall.
c. Size: As indicated on drawings.
d. Fabric: As indicated under Shade Fabric article.

2. Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
a. Hardware Type: Mounting end caps with fascia.
1) Color: White.

3. Multiple Shade Operation: Provide hardware as necessary to operate more than one shade using single operator.

4. Roller Tubes: As required for type of shade operation; designed for removal without removing mounting hardware.
a. Material: Extruded aluminum, with wall thickness and material selected by manufacturer.
b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
c. Fabric Attachment: LSE (Low Stress Energy) double-sided adhesive tape to secure the fabric without having to remove shade roller from shade brackets. Adhesive attachement affords minor lateral adjustments to edge clearance dimensions.
1) Fabric wrap of 2-1/2 to 3 times the circumference of the roller tube required for proper tension of fabric-to-tube.
d. Roller tubes capable of being removed and reinstalled without affecting roller shade limit adjustments.

5. Hembars: Designed to maintain bottom of shade straight and flat; selected from manufacturer's standard options.
a. Style: Exposed hembar; D30 aluminum rectangular hembar with plastic end caps and integral brush light seal.

6. Shade Motor: Mechanical limit, quiet 120 VAC motor, sound level of 44 dBA or less, located as indicated on drawings.

7. Idler Assembly: Molded nylon with adjustable length idler pin or spring-loaded idler to facilitate easy installation and removal of shade for service.

8. Accessories:
a. Light Gap Reduction Channels: Provide extruded aluminum channels to reduce light leakage at sides of shades.
b. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to mounting end caps, without exposed fasteners; powder-coated finish.
1) Color: White.
c. End Cap Covers: Match fascia finish.
d. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.3 Shade Fabric

A. Fabric for Light-Filtering Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
1. Material: Vinyl-coated polyester. Free of lead, phthalates, PVC, formaldehyde, and fragrances.
2. Sustainability Characteristics:
a. OEKO-TEX: STANDARD 100 certification.

3. Performance Requirements:
   a. Sound Absorption: Noise Reduction Coefficient (NRC) of 0.50 when tested in accordance with ASTM C423 for Type G mounting, per ASTM E795.
   b. Flammability: Pass NFPA 701 large and small tests.
4. Color: Pure White.
5. Fabrication:
   a. Fabric Orientation: Railroaded; fabric is turned 90 degrees off roll.
6. Products:
   a. Rollease Acmeda Contract - Solar Screen; Kleenscreen (5% open): www.rolleaseacmedacontract.com.

2.4 Fabric for Room-Darkening Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.

A. Material: Vinyl-coated polyester. Free of lead, phthalates, PVC, formaldehyde, and fragrances.

B. Sustainability Characteristics:
   1. OEKO-TEX: STANDARD 100 certification.

C. Performance Requirements:
   1. Sound Absorption: Noise Reduction Coefficient (NRC) of 0.50 when tested in accordance with ASTM C423 for Type G mounting, per ASTM E795.
   2. Flammability: Pass NFPA 701 large and small tests.

D. Color: Ice.

E. Fabrication:
   1. Fabric Orientation: Railroaded; fabric is turned 90 degrees off roll.

F. Products:
   1. Rollease Acmeda Contract - Eclipse Blackout: www.rolleaseacmedacontract.com.

2.5 Motor Controls and Accessories

A. Unless specifically marked for exclusion, provide required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, and system programming necessary for complete operating system for control intent indicated.

B. Provide components and connections necessary to interface with other systems as indicated.

C. Wired Control for Mechanical Limit, 120 VAC Motors:
   1. Controller: Rollease Acmeda - Automate 4-Channel Controller.
      a. Support control up to four motors with up to three intermediate positions for each motor.
      b. Controls: Up, down, stop, and three preset positions.
      c. Support daisy chaining of multiple controllers for control of multiple groups.
      d. Support interface via hard wire and radio contact module.
   2. Provide wiring from external switches and controls as required.
   3. Color Code:
      a. White: Neutral.
      b. Black: Direction 1.

c. Red: Direction 2.
d. Green: Ground.

2.6 Roller Shade Fabrication

A. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
1. Vertical Dimensions: Fill openings from head to sill with 1/2-inch space between bottom bar and window stool.
2. Horizontal Dimensions - Inside Mounting: Fill openings from wall to wall.

B. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers.

PART 3 EXECUTION

3.1 Examination

A. Field Measurements: Verify actual measurements of openings by field measurements before fabrication; show recorded measurements on shop drawings.

B. Examine finished openings for deficiencies that may preclude satisfactory installation.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Start of installation is considered acceptance of substrates.

3.2 Preparation

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 Installation

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 System Startup

A. Motorized Shade System: Provide services of manufacturer's authorized representative to perform system startup.

3.5 Cleaning

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.6 Closeout Activities

A. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.7 Protection

A. Protect installed products from subsequent construction operations.

END OF SECTION

SECTION 123600
COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Wall-hung counters and vanity tops.

1.2 RELATED REQUIREMENTS

A. Section 064100 - Architectural Wood Casework.

1.3 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program; Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

E. PS 1 - Structural Plywood; 2023.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

D. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

F. Installer's qualification statement.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

B. Quality Certification:
1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
3. Provide designated labels on shop drawings as required by certification program.
4. Provide designated labels on installed products as required by certification program.
5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.1 COUNTERTOPS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
1. Flat Sheet Thickness: 1/2 inch, minimum.
2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
a. Manufacturers: Refer to Drawings and Finish Legends for information.
1) Dupont: www.corian.com.
2) Wilsonart: www.wilsonart.com.
b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
c. Color and Pattern: As selected by Architect from manufacturer's full line.
3. Other Components Thickness: 1/2 inch, minimum.
4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
6. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Premium Grade.

2.2 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of

materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, white.

2.3 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.4 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

A. Clean countertops surfaces thoroughly.

3.6 PROTECTION

A. Protect installed products with non-staining sheet coverings until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 124813
ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.1 Section Includes

A. Extruded aluminum entrance floor grilles.

B. Stainless steel entrance floor gratings.

1.2 Submittals

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating properties of walk-off surface, component dimensions and recessed frame characteristics.

C. Shop Drawings: Indicate dimensions and details for recessed frame.
   1. For recessed frames located within a dimensionally restricted area, show dimensions of space within which the frame will be installed.

D. Samples: Submit two samples, 6 by 6 inches in size illustrating pattern, color, finish, and edging.

PART 2 PRODUCTS

2.1 Manufacturers

A. Entrance Floor Grilles and Gratings:
   1. Matsinc.; Design Track; www.matsinc.com. Contact Matter Surfaces at mattersurfaces.com.
   2. An approved equal
   3. Substitutions: See Section 016000 - Product Requirements.

2.2 Entrance Floor Grilles and Gratings

A. Entrance Floor Grilles (CPT1): Recessed extruded aluminum grille assembly with nominal 1 inch wide tread strips running perpendicular to traffic flow, slots between treads, and perimeter frame forming sides of recess; grille panels drop onto frame and are removable for access to recess.
   1. Recess Depth: 2 inches, nominal.
   2. Tread Surfaces: Cross-cut, rectangular surface, with mill-finished aluminum tread.
   3. Colors: As indicated.
   4. Length in Direction of Traffic Flow: As shown on drawings.
   5. Width Perpendicular to Traffic Flow: As shown on drawings.
   6. Frame: Anodized aluminum for embedding in concrete; minimal exposed trim; stud or hook concrete anchors.

7. Pan: Anodized aluminum bottom pan with drain, sealed to frame.

B. Mounting: Top of non-resilient members level with adjacent floor.

C. Structural Capacity: Capable of supporting rolling load of 1,000 lb without permanent deformation or noticeable deflection.

D. Vibration Resistant Fabrication: Welded, riveted, or bolted members; no snap or friction connections.

PART 3 EXECUTION

3.1 Examination

A. Verify that floor opening for mats are ready to receive work.

3.2 Preparation

A. Vacuum clean floor recess.

3.3 Installation

A. Install frames to achieve flush plane with finished floor surface.

B. Install walk-off surface in floor recess flush with finish floor after cleaning of finish flooring.

3.4 Tolerances

A. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch.

END OF SECTION

SECTION 142100
ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.1 Section Includes

A. Electric traction elevator systems.

B. Work Required
1. The work required under this section consists of all labor, materials, and services required for the elevator as herein specified.
2. All work shall be performed in a first class, safe and workmanlike manner.
3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make complete installation.

C. Products Supplied but Not Installed Under this Section:
1. Hoist Beam
2. Pit Ladder
3. Inserts for mounting in block walls for rail attachments

D. Work Supplied Under Other Sections:
1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb of top landing door.
2. Main line disconnects for each elevator.
   a. One fused three phase permanent power in building electrical distribution room.
3. Hoistway ventialation shall be in accordance with local and national building code requirments.
4. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
5. Removable barricades at all hoistway openings, in compliance with OSHA 1926.502 in addition to any local code requirements.
6. Lifeline attachments capable of withstanding 5000 lb. load in accordance with OSHA 1926.502. Provide a minimum of 2 at the top, front of each hoistway.
7. Pit Lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/ CSA B44 2000, or applicable version.
8. Control Space lighting with switch. Coordinate lighting, with switch, for machine space as allowable by code.
9. Access Doors: As required for access to governor. Access door shall be self-closing, self-locking, if necessary, and operable from the inside without a key.

E. Maintenance Contract.

1.2 Related Requirements - The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer:

A. Section 015000 - Temporary Facilities and Controls: Protection of floor openings and personnel barriers; temporary power and lighting.

B. Section 033000 - Cast-in-Place Concrete: Elevator pit and elevator machine foundation

C. Section 042000 - Unit Masonry: Masonry hoistway enclosure, building-in and grouting hoistway door frames, and grouting of sills.

D. Section 055000 - Metal Fabrications: Divider beams, if necessary, and supports for entrances and rails.

E. .Section 071300 - Sheet Waterproofing: Waterproofing of elevator pit

F. Section 096500 - Resilient Flooring.

G. Section 235000 - Heat Generation Equipment: Ventilation and temperature control of elevator equipment areas, including hoistway

H. Section 260500 - Common Work Results for Electrical:
1. Main disconnects for each elevator
2. Electrical power for elevator installation and testing
3. Disconnecting device to elevator equipment prior to activation of sprinkler system
4. The installation of dedicated GFCI receptacles in the pit and overhead
5. Lighting in controller area, machine area, and pit
6. Wiring for telephone service to controller (if applicable).
7. All electrical work shall be in accordance with the requirements set forth in {RS#1870}.

I. Section 260533.13 - Conduit for Electrical Systems: Electrical conduit requirements.

J. Section 260583 - Wiring Connections: Wiring connection requirements.

K. Section 273000 - Voice Communications: ADAAG - ADA Accessibility Guidelines-required emergency communications equipment

L. Section 283100 - Fire Alarm Systems: Fire and smoke detectors at required locations and interconnecting devices; fire alarm signal lines to contacts in the machine area

M. Section 311000 - Site Clearing: Excavation for elevator pit.

1.3 Reference Standards

A. ADAAG - ADA Accessibility Guidelines - Americans With Disabilities Act (ADA) Accessibility Guidelines For Buildings and Facilities; 2004.

B. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2022.

C. ASME A17.2 - Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators,

Inclined Elevators, Limited-Use/Limited-Application Elevators, Private Residence Elevators, Escalators, Moving Walks, Dumbwaiters, and Material Lifts; 2023.

D. ICC A117.1-2009 - Accessible and Usable Buildings and Facilities; 2009.

E. {RSTEMP#1870}NFPA 70 - National Electrical Code; National Fire Protection Association{CH#187925}.

F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

G. OSHA 1926.502 - Fall protection systems criteria and practices.; Latest.

1.4 System Description

A. Equipment Description: MonoSpace 300 gearless traction elevator.

B. Equipment Control: KCM831

C. Drive: Non-Regenerative

D. Quantity of Elevators: 1 elevator

E. Landings: 2

F. Openings: 1 Front Openings, 1 Back Openingsesignations: Second Floor, First Floor

G. Travel: 10'-9" (Verify in Field)

H. Rated Capacity: 2000 lb

I. Rated Speed: 150 fpm

J. Cab Clear Inside Dimensions: 5'-9" Width x 4'-0 1/2" Depth

K. Cab Height: 7'-6"

L. Clear Cab Height Under Suspended Ceiling: 7'-4"

M. Entrance Type and Width: Lef/Right Opening Door - 36"

N. Entrance Height: 7'-0"

O. Main Power Supply: 208 volts +/- 5% of normal. 3 phase, with a separate equipment grounding conductor

P. Operation: Simplex

Q. Machine Location: Inside the hoistway, mounted on car guide rail

R. Control Space Location: Integrated control

S. Elevator Equipment shall conform to the requirements of seismic zone: NON-SEISMIC.

T. Maintenance Service Period: 12 months

1.5 Performance Requirements

A. Car Performance
1. Car Speed: +/- 5% of contract speed under any loading conditon or direction of travel
2. Car Capacity: Safely lower, stop and hold up to 125% of rated load (code required)

B. System Performance:
1. Vertical Vibration (maximum): 15 milli-g
2. Horizontal Vibration (maximum): 12 milli-g
3. Vertical Jerk (maximum): 3.28 ft/sec^3
4. Accelleration/Deceleration (maximum): 1.31 ft./sec^2
5. In Car Noise: 55 dB(A) maximum
6. Leveling Accuracy: +/- 0.2 inches typical
7. Starts per hour (maximum): 180

1.6 Administrative Requirements

A. Coordination:
1. Coordinate work with other installers to provide necessary conduits for proper installation of wiring, including but not limited to the following:
a. Elevator equipment devices remote from elevator machine room or hoistway.
b. Telephone service for controller (if applicable).
c. Elevator pit for lighting and electrical receptacles.
d. Fire alarm panel from controller cabinet.
2. Coordinate work with other installers for equipment provisions necessary for proper elevator operation, including but not limited to the following:
a. Automatic transfer switches with auxiliary contacts for emergency power transfer status indication.
b. Shunt trip devices for automatic disconnection of elevator power prior to fire suppression system activation; include provisions for shunt trip power monitoring.
c. Overcurrent protection devices selected to achieve required selective coordination.

B. Preinstallation Meeting: Convene meeting at least one week prior to start of this work.
1. Review schedule of installation, proper procedures and conditions, and coordination with related work.

C. Construction Use of Elevator: Not permitted.

1.7 Submittals

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's product data for each system proposed for use. Include the following:
1. Signal and operating fixtures, operating panels, and indicators.
2. Car design, dimensions, layout, finishes, accessories, available options, and components.
3. Car and hoistway door and frame details.
4. Electrical characteristics and connection requirements.
5. Expected heat dissipation of elevator equipment in hoistway (BTUs)

6. Color selection chart for Cab and Entrances

C. Shop Drawings: Include appropriate plans, elevations, sections, diagrams, and details on following items:
   1. Elevator Equipment and Machines: Size and location of driving machines, power units, controllers, governors, and other components.
   2. Hoistway Components: Size and location of car, car machine beams, guide rails, buffers, ropes, and other components in the hoistway.
   3. Rail bracket spacing, including maximum spacing allowable; maximum loads imposed on guide rails requiring load transfer to building structural framing.
   4. Individual weight of principal components; load reaction at points of support, include maximum loads imposed on building structure.
   5. Clearances and over-travel of car and counterweight.
   6. Locations in hoistway of traveling cables and connections for car lighting and telephone.
   7. Location and sizes of hoistway, pit, car doors, and frames.
   8. Location and sizes of access doors, hoistway entrances, and frames
   9. Calculated heat dissipation of elevator equipment.
   10. Electrical characteristics and connection requirements.
   11. Indicate arrangement of elevator equipment and allow for clear passage of equipment through access openings.

D. Samples: Submit samples illustrating car floor material, car interior finishes, car and hoistway door and frame finishes, and handrail material and finish in the form of cut sheets or finish color selection brochures.

E. Manufacturer's qualification statement.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Initial Maintenance Contract.

H. Maintenance Contract: Submit proposal to Owner for standard one year continuing maintenance contract agreement in accordance with ASME A17.1 and requirements as indicated, starting on date initial maintenance contract is scheduled to expire.
   1. Indicate in proposal the services, obligations, conditions, and terms for agreement period and for renewal options.

I. Operation and Maintenance Data:
   1. Parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and identifying code.
   2. Operation and maintenance manual.
   3. Schematic drawings of equipment and wiring diagrams of installed electrical equipment with list of corresponding symbols to identify markings on hoistway apparatus.

J. Diagnostic Tools
   1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed.

This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment, and parametric software changes which are available to the Elevator Contractor.
In those cases where diagnostic tools provided to the Owner require perdiodic recallibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the completed project. During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-callibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacment for the tool at no additional cost to the Owner.
The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and installed by the Elevator Contractor.
Accompanying the printed instructions shall be any and all access codes, passwords, or other proprietary information that is necessar to interface with the microprocessor-control equipment.

1.8 Quality Assurance

A. Manufacturer Qualifications: Company specializing in the fabrication, installation, and service of products specified in this section with minimum fifteen years documented experience. The manufacturer shall have a documented quality assurance program.

B. Elevator Installer: Elevators shall be installed by the manufacturer.

C. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations of such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

1.9 Delivery, Storage, and Handling

A. If the construction site is not prepared to receive the elevator equipment at the agreed upon ship date, the General Contractor shall be responsible for the cost of storage at an approved facility. Additional labor costs for double handling will be the responsibility of the General Contractor.

B. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations. A minimum storage area of 10 feet by 20 feet is required adjacent to the hoistway.

1.10 Warranty

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer warranty for a period of one year. The warranty period is to begin upon final acceptance of the Contract. Warranty covers defects in materials and workmanship.

Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.

1.11 Maintenance and Service

A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 months after date of final acceptance. Predictive maintenance shall be included for the full maintenance period. This service must be capable of using AI-based analytics to identify potential equipment issues and notifying the elevator providor via an internet connection. Replacement parts shall be produced by the original eqipment manufacturer.

B. Maintenance service shall be performed during regular working hours of regular working days and shall include emergency call back service during regular working hours.

C. Maintenance service shall not include adjustments, repairs, or replacement of parts due to negligence, misuse, abuse, or accidents.

PART 2 PRODUCTS

2.1 Manufacturers

A. Electric Traction Elevators: Provide AC gearless, machine room-less elevator systems subject to compliance with the design and performance requirements of this specification. Elevator manufacturers may include but are not limited to one of the following:
1. Basis of Design: MonoSpace 300 traction elevators by KONE, Inc. (www.kone.com) For information and pricing please reach out to Brenden.Byrne@kone.com. 347-454-8333.
2. An approved equal.

B. Substitutions: See Section 016000 - Product Requirements.

2.2 Equipment: Control Components and Control Space

A. Controller: Provide microprocessor-based control system to perform all functions.
1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
2. Controller shall be separated into two distinct havles: Motor Drive side and Control Side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
3. Provide a serial cardtrack and main CPU board containing a non-erasable EPROM and operating system firmware.
4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.

B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.

C. Controller Location: Locate controller(s) in the fornt wall integrated with the top landing entrance frame, machine side of the elevator. One non-fused three phase permenant power in hoistway at top landing. A separate control space shall not be required.

2.3 Equipment: Hoistway Components

A. Machine: AC gearless machine, with permenant magnet sycnchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.

B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.

C. Buffers, Car, and Counterweight: Polyurethane type buffers.

D. Hoistway Operating Devices:
1. Emergency stop switch in the pit.
2. Terminal stopping switches.
3. Emergency stop switch on the machine

E. Positioning System: System consisting of magnets and proximity switches.

F. Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.4 Equipment: Hoistway Entrances

A. Hoistway Entrances
1. Sills shall be extruded aluminum.
2. Doors: Entrance doors shall be of metal construction with internal, vertical channel, reinforcements.
3. Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour, in accordance with NFPA 80.
4. Entrance Finish: Brushed Stainless Steel
5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refe to manufacturer drawings.

2.5 Equipment: Car Components

A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.

B. Car Safeties: Device will be provided and mounted under the car platform, securely bolted to the Care Frame. The safety will be actuated by a centrifugal governor mounted at the top of the hoistway. The safety is designed to operate in case the car attains excessive descending speed.

C. Platform: Platform shall be all steel construction.

D. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.

E. Car Wall Finish:
1. Side Walls: Bleached Lengo 8845-58 Formica (L439)
2. Car Front, Door, and Skirting: Brushed Stainless Steel
3. Ceiling: Round, LED spotlights
4. Handrails: Brushed Stainless Steel, located on sides of car enclosure
5. Sills: Extruded aluminum

F. Cab Wall Protection Pads: Included

G. Flooring: By Others - Refer to Specification Section 096500 - Resilient Flooring.

H. Emergency Car Signals
1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.
2. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
3. Emergency Exit Contact: An electircal contact shall be provided on the car-top exit.

I. Ventilation: Manufacturer's standard cab fan, mounted to the ceiling to facilitate in-car air circulation, meeting ASME A17.1 code requirements.

2.6 Equipment: Signal Devices and Fixtures

A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation. Fixture finish to be Brushed Stainless Steel.
1. Main Flush mounted car operating panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have Amber Dot Matrix illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be Amber Dot Matrix. All texts, when illuminated, shall be Amber Dot Matrix. The car operating panel shall have a Brushed Stainless Steel finish.
2. Additional features of car operating panel shall include:
a. Car Position Indicator within operating panel, Brushed Stainless Steel
b. Elevator Data Plate marked with elevator capacity and car number on car top.
c. Hhelp Buttons with raised markings
d. In-car Stop Switch, per local code
e. Call Cancel Button

B. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Hall fixtures shall have a Brushed Stainless Steel finish.
1. Hall fixtures shall feature round, mechanical, buttons in applied mount face frame. Hall fixtures shall correspond to options available from that landing. Buttons shall be in a vertically mounted fixture.

C. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel, and a chime will sound. The chime will sound once for up and twice for down. The car riding lantern face plate shall have a Brushed Stainless Steel finish.

2.7 Equipment: Elevator Operation and Controller

A. Elevator Operation

1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
2. Zoned Car Parking
3. Relative System Response Dispatching

B. Standard Operating Features to include:
1. Full Collective Operation
2. Fan and Light Control
3. Load Weighing Bypass
4. Ascending Car Uncontrolled Movement Protection
5. Top of Car Inspection Station

C. Additional Operating Features to include:
1. Independent Service
2. Hoistway Access Bottom Landing
3. Hoistway Access Top Landing
4. Car Wall Protection Pads
5. Emergency Battery Power Supply
   a. When the main line power is lost for longer than 5 seconds the emergency battery power supply provides power automatically to the elevator controller. The elevator wikll rise or lower to the first available landing, open the doors, and shut down. The elevator will return to service upon the return of normal main line power. An auxiliary contact on the main line disconnect and shunt trip breaker (if required) shall be provided by others.

D. Elevator Control System for Inspections and Emergency
1. Provide devices within controller to run the elevator in inspection operation.
2. Provide devices on car top to run the elevator in inspection operation.
3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
7. Provide the means for the control to reset elevator earthquake operation.

2.8 Equipment: Door Operator and Control

A. Door Operator: A closed loop permenant magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and lock. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.

B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable

code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.

C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.

D. Door hangers and t4racks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.

E. Electronic Door Safety Device: The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The door shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

2.9 Provide elevator system, components, and controls that comply with the requirements of ICC A117.1-2009, unless otherwise indicated.

PART 3 EXECUTION

3.1 Examination

A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.

B. Do not proceed with the work until unsatisfactory conditions are corrected.

C. Prior to start of work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.

D. Prior to start of work, verify projections greater than two inches (four inches if ASME A17.1 applies) must be beveled not less than 75 degrees from horizontal.

E. Prior to start of work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.

F. Prior to start of work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.

G. Prior to start of work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including sleeves and penetrations.

H. Verify installation of GFCI protected, 20-amp power outlet in pit and adjacent to each signal control cabinet in control space.

3.2 Preparation

A. Arrange for temporary electrical power for installation work and testing of elevator components. See Section 015000 - Temporary Facilities and Controls for additional requirements.

B. Maintain elevator pit excavation free of water.

C. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.3 Installation

A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.

B. Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.

C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.

D. Lubricate operating system components in accordance with manufacturer recommendations.

E. Perform final adjustments, and necessary service prior to final acceptance.

3.4 Construction

A. Interference with Other Work:
1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.
2. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.
3. Ensure adequate support for entrance attachment points at all landings.
4. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves withn the hoistway wall.
5. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
6. Coordinate interface of elevators and fire alarm system.
7. Coordinate interface of dedicated telephone line.
8. Coordinate the installation of the non-fused three phase permanent power disconnect in hoistway at top landing.

B. Tolerances
1. Guide Rail Alignment: Plumb and parallel to each other in accordance with ASME A17.1 and ASME A17.2.
2. Car Movement on Aligned Guide Rails: Smooth movement, without any objectionable lateral or oscillating movement or vibration.

3.5 Testing and Inspections

A. Perform recommended and required testing in accordance with authority having jurisdiction.

B. Obtain required permits and provide originals to Owner's Representative.

3.6 Demonstration

A. Prior to final acceptance, instruct Owner's Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures.

3.7 Cleaning

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove protective coverings from finished surfaces.

C. Clean surfaces and components in accordance with manufacturers written instructions.

3.8 Protection

A. Do not permit construction traffic within car after cleaning.

B. Protect installed products until Date of Substantial Completion.

C. Touch up, repair, or replace damaged products and materials before Date of Substantial Completion.

3.9 Maintenance

A. Provide Initial Maintenance Contract of elevator system and components in accordance with ASME A17.1 and requirements as indicated for twelve months from Date of Substantial Completion.

B. Perform maintenance contract services using competent and qualified personnel under the supervision and direct employ of the elevator manufacturer or installer.

C. Maintenance contract services shall not be assigned or transferred to any agent or other entity without prior written consent of Owner.

D. Include systematic examination, adjustment, and lubrication of elevator equipment.

E. Perform work without removing cars from use during peak traffic periods.

F. Provide emergency call back service during regular working hours throughout period of this maintenance contract.

G. Maintain an adequate stock of parts for replacement or emergency purposes, and have personnel available to ensure the fulfillment of this maintenance contract without unreasonable loss of time.

END OF SECTION

SECTION 210517

SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

1.1 SUMMARY

A. Section Includes:

1. Sleeves without waterstop.
2. Sleeves with waterstop.
3. Stack-sleeve fittings.
4. Sleeve-seal systems.
5. Grout.
6. Silicone sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends.

B. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.

C. Steel Sheet Sleeves: ASTM A653/A653M, 0.0239-inch minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.

D. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

E. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 SLEEVES WITH WATERSTOP

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, LLC.
2. GPT; an EnPro Industries company.
3. Metraflex Company (The).

B. Description: Manufactured PVC/HDPE or galvanized steel, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

2.3 STACK-SLEEVE FITTINGS

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. Jay R. Smith Mfg Co; a division of Morris Group International.
2. Wade; a subsidiary of McWane Inc.
3. Zurn Industries, LLC.

B. Description: Manufactured, Dura-coated or Duco-coated cast-iron sleeve with integral clamping flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.4 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, LLC.
2. GPT; an EnPro Industries company.
3. Metraflex Company (The).

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Designed to form a hydrostatic seal of 20 psig minimum.
2. Sealing Elements: EPDM-rubber or Nitrile (Buna N) interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
3. Pressure Plates: Stainless steel.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.5 GROUT

A. Description: Non-shrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000 psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.6 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, non-sag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. GE Construction Sealants; Momentive Performance Materials Inc.
b. Polymeric Systems, Inc.
c. Sherwin-Williams Company (The).
d. Sika Corporation.
e. The Dow Chemical Company.

2. Standard: ASTM C920, Type S, Grade NS, Class 25, Use NT.

B. Silicone, S, P, T, NT: Single-component, 25, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Sika Corporation.
b. The Dow Chemical Company.

2. Standard: ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

C. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Smooth-On.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES - GENERAL

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 or silicone sealant, seal 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-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 INSTALLATION OF SLEEVES WITH WATERSTOP

A. Install sleeve with waterstop as new walls and slabs 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 or silicone sealant, seal space around outside of sleeves.

3.3 INSTALLATION OF STACK-SLEEVE FITTINGS

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 3 inches above finished floor level.

4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using waterproof silicone sealant, seal space between top hub of stack-sleeve fitting and pipe.

B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- or smoke-stop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building and passing through exterior walls.

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.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
2. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.6 SLEEVE SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above and below Grade:

a. Sleeves with waterstops.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

2. Concrete Slabs-on-Grade:

a. Sleeves with waterstops.

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. Sleeves with waterstops or stack-sleeve fittings.

4. Interior Walls and Partitions:

    a. Sleeves without waterstops.

END OF SECTION 210517

SECTION 210518

ESCUTCHEONS FOR FIRE-SUPPRESSION 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 DEFINITIONS

A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Stainless-Steel Type: With polished stainless-steel finish.

B. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

C. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

D. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed hinge; and spring-clip fasteners.

2.2 FLOOR PLATES

A. Split Floor Plates: Steel 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 and Relocated Existing Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
b. Chrome-Plated Piping: One-piece cast brass or split-plate cast brass with polished, chrome-plated finish.
c. Insulated Piping: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stainless steel with polished stainless-steel finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
f. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stainless steel with polished stainless-steel finish.
h. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
i. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
j. Bare Piping in Unfinished Service Spaces: One-piece steel with polished, chrome-plated finish.
k. Bare Piping in Unfinished Service Spaces: One-piece cast brass with polished, chrome-plated finish.
l. Bare Piping in Unfinished Service Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
m. Bare Piping in Equipment Rooms: One-piece cast brass with polished, chrome-plated finish.
n. Bare Piping in Equipment Rooms: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.

2. Escutcheons for Existing Piping to Remain:

a. Chrome-Plated Piping: Split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.

e. Bare Piping in Unfinished Service Spaces: Split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
f. Bare Piping in Equipment Rooms: Split-plate, stamped steel with concealed hinge 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 and Relocated Existing Piping: One-piece, floor plate.
2. Existing Piping: Split floor plate.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 210518

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. Trapeze pipe hangers.
3. Fastener systems.
4. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 210516 "Expansion Fittings and Loops for Fire-Suppression Piping" for pipe guides and anchors.
3. Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment" for vibration isolation devices and seismic restraints.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. 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. Include design calculations for designing trapeze hangers.

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.

B. Pipe Welding Qualifications: Qualify procedures and operators according to 2015 ASME Boiler and Pressure Vessel Code, Section IX.

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 and obtain approval from authorities having jurisdiction.

C. NFPA Compliance: Comply with NFPA 13.

D. UL Compliance: Comply with UL 203.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Steel Pipe Hangers and Supports:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. AAA Technology & Specialties Co., Inc.
   b. Bergen-Power Pipe Supports.

c. Empire Industries, Inc.
d. ERICO/Michigan Hanger Co.
e. Globe Pipe Hanger Products, Inc.
f. Grinnell Corp.
g. National Pipe Hanger Corporation.
h. PHD Manufacturing, Inc.

2. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
3. Galvanized Metallic Coatings: Pregalvanized or hot-dip galvanized.
4. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
5. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with NFPA-approved, UL-listed, or FM-approved carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 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.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Hilti, Inc.
   b. ITW Ramset/Red Head.
   c. Masterset Fastening Systems, Inc.
   d. MKT Fastening, LLC.
   e. Powers Fasteners.

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. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Hilti, Inc.
   b. ITW Ramset/Red Head.
   c. MKT Fastening, LLC.
   d. Powers Fasteners.

2. Indoor Applications: Zinc-coated or Stainless steel.
3. Outdoor Applications: Stainless steel.

2.5 EQUIPMENT SUPPORTS

A. Description: NFPA-approved, UL-listed, or FM-approved, welded, shop- or field-fabricated equipment support, made from structural-carbon-steel shapes.

2.6 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 water-filled components plus 250 lb.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

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. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. 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 A36/A36M 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 strut 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. 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.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. 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.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. 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.

K. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. 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.

M. 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. MSS SP-58, Type 39 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. MSS SP-58, Type 40 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 of same thickness as piping insulation.

3.3 INSTALLATION OF 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 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/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 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touchup:

1. 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.
   a. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
   b. Clean and touchup painting of field welds, bolted connections and abraded, shop-painted areas on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

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 stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

F. 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.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 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.

H. Hanger-Rod Attachments: Comply with NFPA requirements.

I. 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.

J. 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.

K. Comply with NFPA requirements for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

L. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

M. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 210529

SECTION 210553

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. Warning tape
4. Pipe labels.
5. Stencils.
6. Valve tags.
7. 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-numbering scheme.

E. Valve Schedules: Provide for fire-suppression piping system. Include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Brady Corporation.
   b. Craftmark Pipe Markers.

c. Marking Services, Inc.
d. Seton Identification Products.

2. Material and Thickness: Brass, 0.032 inch or aluminum, 0.032 inch thick, with predrilled or stamped holes for attachment hardware.
3. Letter and Background Color: As indicated for specific application under Part 3.
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 of 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.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Brady Corporation.
   b. Craftmark Pipe Markers.
   c. Marking Services, Inc.
   d. Seton Identification Products.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch or 1/8 inch thick, with predrilled holes for attachment hardware.
3. Letter and Background Color: As indicated for specific application under Part 3.
4. Maximum Temperature: Able to withstand temperatures of 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 of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. 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.

2.2 WARNING SIGNS AND LABELS

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:
   a. Brady Corporation.
   b. Craftmark Pipe Markers.
   c. Marking Services, Inc.

d. Seton Identification Products.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch or 1/8 inch thick, with predrilled holes for attachment hardware.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Maximum Temperature: Able to withstand temperatures of 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 of 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. Arc-Flash Warning Signs: Provide arc-flash warning signs in locations and with content in accordance with requirements of OSHA and NFPA 70E, and other applicable codes and standards.

J. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 WARNING TAPE

A. Material: Vinyl.

B. Minimum Thickness: 0.005 inch.

C. Letter, Pattern, and Background Color: As indicated for specific application under Part 3.

D. Waterproof Adhesive Backing: Suitable for indoor or outdoor use.

E. Maximum Temperature: 160 deg F.

F. Minimum Width: 2 inches.

2.4 PIPE LABELS

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:

a. Brady Corporation.

b. Craftmark Pipe Markers.
c. Marking Services, Inc.
d. Seton Identification Products.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

E. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

F. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include the following:

1. Pipe size.
2. Flow-Direction Arrows: Include flow-direction arrows on main distribution piping. Arrows may be either integral with label or applied separately.
3. Lettering Size: Size letters in accordance with ASME A13.1 for piping with at least 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.

2.5 STENCILS

A. Stencils for Piping:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Craftmark Pipe Markers.
   b. Marking Services, Inc.

2. Lettering Size: Size letters in accordance with ASME A13.1 for piping with at least 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.
3. Stencil Material: Aluminum, brass, or fiberboard.
4. Stencil Paint: Exterior, gloss, acrylic enamel. Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, acrylic enamel. Paint may be in pressurized spray-can form.
6. Letter and Background Color: As indicated for specific application under Part 3.

2.6 VALVE TAGS

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:

a. Brady Corporation.

b. Craftmark Pipe Markers.
c. Marking Services, Inc.
d. Seton Identification Products.

B. Description: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.04 inch or aluminum, 0.031 inch thick, with predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire link chain or S-hook.

C. Letter and Background Color: As indicated for specific application under Part 3.

D. 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. Include valve-tag schedule in operation and maintenance data.

2.7 WARNING TAGS

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:
a. Brady Corporation.
b. Craftmark Pipe Markers.
c. Marking Services, Inc.
d. Seton Identification Products.

B. 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. Letter and Background Color: As indicated for specific application under Part 3.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION GENERAL REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF EQUIPMENT LABELS, WARNING SIGNS, AND LABELS

A. Permanently fasten labels on each item of fire-suppression equipment.

B. Sign and Label Colors:

1. White letters on an ANSI Z535.1 safety-red background unless otherwise indicated.

C. Locate equipment labels where accessible and visible.

D. Arc-Flash Warning Signs: Provide arc-flash warning signs on electrical disconnects and other equipment where arc-flash hazard exists, as indicated on Drawings, and in accordance with requirements of OSHA and NFPA 70E, and other applicable codes and standards.

3.4 INSTALLATION OF WARNING TAPE

A. Warning Tape Color and Pattern: Yellow background with black diagonal stripes unless otherwise indicated.

B. Install warning tape on pipes and ducts, with cross-designated walkways providing less than 6 ft. of clearance.

C. Locate tape so as to be readily visible from the point of normal approach.

3.5 INSTALLATION OF PIPE LABELS

A. Install pipe labels showing service and flow direction with permanent adhesive on pipes.

B. Stenciled Pipe-Label Option: Stenciled labels showing service and flow direction 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.

C. 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. Within 3 ft. of each valve and control device.
2. At access doors, manholes, and similar access points that permit a view of concealed piping.
3. Within 3 ft. of equipment items and other points of origination and termination.
4. Spaced at maximum intervals of 25 ft. along each run. Reduce intervals to 10 ft. in areas of congested piping and equipment.

D. Flow- Direction Arrows: Provide arrows to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

E. Fire-Suppression Pipe Label Color Schedule:

1. Fire-Suppression Pipe Labels: White letters on an ANSI Z535.1 safety-red background unless otherwise indicated.

3.6 INSTALLATION OF VALVE TAGS

A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule in the operating and maintenance manual. Include the identification "FSV" on all fire-suppression system valve tags.

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.

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. Dry-Pipe Sprinkler System: 1-1/2 inches, round.
d. Foam-Water System: 1-1/2 inches, round.
e. Clean-Agent Fire-Extinguishing System: 1-1/2 inches, round.
f. Preaction System: 1-1/2 inches, round.

2. Valve-Tag Color: White letters on an ANSI Z535.1 safety-red background unless otherwise indicated.

3.7 INSTALLATION OF WARNING TAGS

A. Warning Tag Color: Black letters on an ANSI Z535.1 safety-yellow background.

B. Attach warning tags, with proper message, to equipment and other items where indicated on Drawings.

END OF SECTION 210553

SECTION 211119

FIRE DEPARTMENT CONNECTIONS

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. Exposed-type fire-department connections.
2. Flush-type fire-department connections.
3. Yard-type fire-department connections.

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 each fire-department connection.

PART 2 - PRODUCTS

2.1 EXPOSED-TYPE FIRE-DEPARTMENT CONNECTION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Fire Hose & Cabinet.
2. Elkhart Brass Mfg. Co., Inc.
3. Guardian Fire Equipment, Inc.
4. Fire-End & Croker Corporation.

B. Standard: UL 405.

C. Type: Exposed, projecting, for wall mounting.

D. Pressure Rating: 175 psig 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.

J. Number of Inlets: Minimum of Two. Contractor shall provide one inlet for each 250 gpm of system rated capacity.

K. Escutcheon Plate Marking: Similar to "AUTO SPKR" or "AUTO SPKR & STANDPIPE" or "STANDPIPE."

L. Finish: Polished chrome plated or Rough brass or bronze.

M. Outlet Size: NPS 4 unless otherwise indicated.

2.2 FLUSH-TYPE FIRE-DEPARTMENT CONNECTION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Fire Hose & Cabinet.
2. Elkhart Brass Mfg. Co., Inc.
3. Potter Roemer LLC.

B. Standard: UL 405.

C. Type: Flush, for wall mounting.

D. Pressure Rating: 175 psig 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: Rectangular, brass, wall type.

I. Outlet: With pipe threads.

J. Body Style: Horizontal unless otherwise indicated.

K. Number of Inlets: Minimum of Two. Contractor shall provide one inlet for each 250 gpm of system rated capacity.

L. Outlet Location: Back unless otherwise indicated.

M. Escutcheon Plate Marking: Similar to "AUTO SPKR" or "AUTO SPKR & STANDPIPE" or "STANDPIPE."

N. Finish: Polished chrome plated or Rough brass or bronze.

O. Outlet Size: NPS 4 unless otherwise indicated.

2.3 YARD-TYPE FIRE-DEPARTMENT CONNECTION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Fire Hose & Cabinet.
2. Elkhart Brass Mfg. Co., Inc.
3. Potter Roemer LLC.

B. Standard: UL 405.

C. Type: Exposed, freestanding.

D. Pressure Rating: 175 psig minimum; 300 psig.

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, floor type.

I. Outlet: Bottom, with pipe threads.

J. Number of Inlets: Minimum of Two. Contractor shall provide one inlet for each 250 gpm of system rated capacity.

K. Sleeve: Brass.

L. Sleeve Height: 18 inches.

M. Escutcheon Plate Marking: Similar to "AUTO SPKR" or "AUTO SPKR & STANDPIPE" or "STANDPIPE."

N. Finish, Including Sleeve: Polished chrome plated or Rough brass or bronze.

O. Outlet Size: NPS 4 unless otherwise indicated.

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 yard-type fire-department connections in concrete slab support. Comply with requirements for concrete in Section 033000 "Cast-in-Place Concrete."

C. Install two protective pipe bollards around each fire-department connection. Comply with requirements for bollards in Section 055000 "Metal Fabrications."

D. Install automatic (ball-drip) drain valve at each check valve for fire-department connection.

END OF SECTION 211119

SECTION 211313

WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel pipe and fittings.
2. Specialty valves.
3. Air vent.
4. Sprinkler piping specialties.
5. Sprinklers.
6. Alarm devices.
7. Manual control stations.
8. Control panels.
9. Pressure gauges.

B. Related Requirements:

1. Section 211119 "Fire Department Connections" for exposed-, flush-, and yard-type fire department connections.

1.2 DEFINITIONS

A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig, but not higher than 300 psig.

B. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

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: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated Design Submittals: For wet-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.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler system plans and sections, or Building Information Model (BIM), drawn to scale, showing the items described in this Section and coordinated with all building trades.

B. Qualification Data: For qualified Installer and professional engineer.

C. Design Data: Approved sprinkler piping working plans, prepared according to NFPA 13, including documented approval by authorities having jurisdiction, and including hydraulic calculations if applicable.

D. Welding certificates.

E. Field Test Reports:

1. 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."
2. Fire-hydrant flow test report.

F. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and 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. 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.

1.7 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 qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.8 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, and Owner no fewer than two days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Architect's, Construction Manager's and Owner's written permission.

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. Sprinkler system equipment, specialties, accessories, installation, and testing to comply with NFPA 13.

C. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

D. High-Pressure Piping System Component: Listed for 300-psig working pressure.

E. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

1. Available fire-hydrant flow test records indicate the following conditions: Refer to Fire Protection Contract Drawings.

2. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.

3. Sprinkler Occupancy Hazard Classifications: According to NFPA 13 recommendations unless otherwise noted.

4. Minimum Density for Automatic-Sprinkler Piping Design: According to NFPA 13 recommendations unless otherwise noted.

5. Minimum Density for Deluge-Sprinkler Piping Design: According to NFPA 13 recommendations unless otherwise noted.

6. Maximum protection area per sprinkler according to UL listing.

7. Maximum Protection Area per Sprinkler: According to NFPA 13 recommendations unless otherwise noted.

8. Total combined Hose-Stream Demand Requirement: According to NFPA 13 recommendations unless otherwise noted.

F. Obtain documented approval of sprinkler system design from authorities having jurisdiction.

G. Seismic Performance: Sprinkler piping to withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7. See Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

2.2 STEEL PIPE AND FITTINGS

A. Standard-Weight, Black-Steel Pipe: ASTM A53/A53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Black-Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.

C. Black Steel Pipe Nipples: ASTM A733, made of ASTM A53/A53M, standard-weight, seamless steel pipe with threaded ends.

D. Steel Couplings: Uncoated steel, ASTM A865/A865M, threaded.

E. Gray-Iron Threaded Fittings: 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.

1. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free or EPDM rubber gasket.

   a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
   b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.

2. Metal, Pipe-Flange Bolts and Nuts: Carbon steel unless otherwise indicated.

I. Steel Welding Fittings: ASTM A234/A234M and ASME B16.9.

1. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

J. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Anvil International/Smith-Cooper International; Tailwind Capital, LLC.
   b. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
   c. Victaulic Company.

2. Pressure Rating: 175-psig minimum or 300-psig where exposed to higher pressures.
3. Grooved-End Fittings for Steel Piping: Uncoated grooved-end fittings, ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 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.
2. High-Pressure Piping Specialty Valves: 300-psig.

C. Body Material: Cast or ductile iron.

D. Size: Same as connected piping.

E. End Connections: Flanged or grooved.

F. Alarm Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Reliable Automatic Sprinkler Co., Inc. (The)
   b. Tyco Fire Products LP.
   c. Victaulic Company.

2. Standard: UL 193.
3. Design: For horizontal or vertical installation.
4. Drip cup assembly pipe drain with check valve to main drain piping.

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.

G. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Reliable Automatic Sprinkler Co., Inc. (The).
b. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.

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.

2.4 AIR VENT

A. Manual Air Vent/Valve:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. AGF Manufacturing, Inc.
b. National Fittings, Inc.
c. Victaulic Company.

2. Description: Ball valve that requires human intervention to vent air.
3. Body: Forged brass.
4. Ends: Threaded.
5. Minimize Size: 1/2 inch.
6. Minimum Water Working Pressure Rating: 300 psig.

B. Automatic Air Vent:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. AGF Manufacturing, Inc.
b. CLA-VAL.
c. Metraflex Company (The).

2. Description: Automatic air vent that automatically vents trapped air without human intervention.

3. Standard: UL listed or FM Global approved for use in wet-pipe fire sprinkler systems.
4. Vents oxygen continuously from system.
5. Float valve to prevent water discharge.
6. Minimum Water Working Pressure Rating: 175 psig.

C. Automatic Air Vent Assembly:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. AGF Manufacturing, Inc.
   b. Potter Electric Signal Company, LLC.

2. Description: Automatic air vent assembly that automatically vents trapped air without human intervention, including Y-strainer and ball valve in a pre-piped assembly.
3. Standard: UL listed or FM Global approved for use in wet-pipe fire sprinkler system.
4. Vents oxygen continuously from system.
5. Float valve to prevent water discharge.
6. Minimum Water Working Pressure Rating: 175 psig.

2.5 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Anvil International/Smith-Cooper International; Tailwind Capital, LLC.
   b. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
   c. Victaulic Company.

2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum or 300 psig.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Reliable Automatic Sprinkler Co., Inc. (The).

b. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
c. Victaulic Company.

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum or 300 psig.
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 or grooved.

C. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Elkhart Brass Mfg. Co., Inc.
b. Fire-End & Croker Corporation.
c. Potter Electric Signal Company, LLC.

2. Standard: UL 199.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. AGF Manufacturing, Inc.
b. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
c. Victaulic Company.
d. Viking Group Inc.

2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
3. Pressure Rating: 175-psig minimum or 300 psig.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. CECA, LLC.
    b. CPS Products, Inc.
    c. Merit Manufacturing.

2. Standard: UL 1474.
3. Pressure Rating: 250-psig minimum or 300 psig.
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

F. Flexible Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Victaulic
    b. FlexHead Industries, Inc.
    c. Reliable Automatic Sprinkler Company

2. Description: In lieu of rigid pipe offsets or return bends for sprinkler drops, Multiple-Use Flexible Stainless-Steel Sprinkler Drop System with or without captured coupling may be used to locate sprinklers as required by final finished ceiling tiles and walls. The drop system shall consist of a braided type 304 stainless steel flexible tube, zinc plated steel Male threaded nipple or capture coupling for connection to branch-line piping, and a zinc plated steel reducer with a female thread for connection to the sprinkler head.
    a. 1” Captured Coupling: Single-bolt, consisting of two ductile iron housings, Grade E “EPDM” gasket, and a zinc electroplated steel bolt and nut conforming to ASTM A449.
    b. The drop shall include a UL approved braided hose with an inner diameter of 1” and a bend radius to 3” to allow for proper installation in confined spaces. The hose shall be listed for (4) bends at 31” length, (5) bends at 36” length, (8) bends at 48” length, (10) bends at 60” length (12) bends at 72” length.
    c. In lieu of rigid connections to dry sprinkler heads, a Victaulic Vicflex dry sprinkler, model VS1 (or AB6 for freezer & cooler box applications) may be used. The sprinkler shall provide a vertical or horizontal flexible connection with a bend radius to 2” and allow for up to 4 bends.
    d. Union joints shall be provided for ease of installation. The flexible drop shall attach to the ceiling grid using bracket system for use with braided hose and reducer, as per UL Listing. The braided drop system is UL listed for sprinkler services to 175 psi and FM Approved to 200 psi.
        1) All hoses shall be factory-pressure tested to 400 psi.
        2) Approvals:
            1) FM-1637
            2) UL 2443

2.6 SPRINKLERS

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. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc. (The).
3. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
4. Victaulic Company.
5. Viking Group Inc.

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Residential Sprinklers: 175-psig maximum.

D. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

E. Pressure Rating for High-Pressure Automatic Sprinklers: 300 psig.

F. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Residential Applications: UL 1626.
4. 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.

G. Sprinkler Finishes: Chrome plated and painted unless otherwise indicated.

H. Special Coatings: Wax or corrosion-resistant paint, where indicated on drawings.

I. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat or Chrome-plated steel, two piece, with 1-inch vertical adjustment.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

J. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Reliable Automatic Sprinkler Co., Inc. (The).
b. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
c. Victaulic Company.

d. Viking Group Inc.

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.7 ALARM DEVICES

A. Alarm-device types to match piping and equipment connections.

B. Electrically Operated Notification Appliances:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Fire-Lite Alarms; Honeywell International, Inc.
b. Notifier; Honeywell International, Inc.
c. Potter Electric Signal Company, LLC.

2. Electric Bell:

a. Standard: UL 464.
b. Type: Vibrating, metal alarm bell.
c. Size: 8-inch minimum diameter.
d. Voltage: 120 V ac, 60 Hz, 1 phase.
e. Finish: Red-enamel or polyester powder-coat factory finish, suitable for outdoor use with approved and listed weatherproof backbox.

3. Strobe/Horn:

a. Standard: UL 464.
b. Tone: Selectable, steady, Temporal-3 (T-3) in accordance with ISO 8201 and ANSI/ASA S3.41, 2400 Hz, electromechanical, broadband.
c. Voltage: 120 V ac, 60 Hz.
d. Effective Intensity: 110 cd.
e. Finish: Red, suitable for outdoor use with approved and listed weatherproof backbox. White letters on housing identifying device as for "Fire."
f. Sign, Integrated: Mount between backbox and strobe/horn with text visible on both sides, above and below strobe/horn. Housing to be shaped to cover surface-mounted weatherproof backbox. Sign is to consist of white lettering on red plastic identifying it as a "Sprinkler Fire Alarm" and instructing viewers to call 911, police, or fire department.

C. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Potter Electric Signal Company, LLC.

b. System Sensor.
c. Viking Group Inc.
d. Watts Water Technologies; a Watts company.

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:

a. Potter Electric Signal Company, LLC.
b. System Sensor.
c. Tyco Fire Products; brand of Johnson Controls International plc, Building Solutions North America.
d. Viking Group Inc.

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:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Fire-Lite Alarms; Honeywell International, Inc.
b. Potter Electric Signal Company, LLC.
c. System Sensor.

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.
6. 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 CONTROL PANELS

A. Description: Single-area, two-area, or single-area cross-zoned control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves.

1. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" when used with thermal detectors and Class A detector circuit wiring.
2. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.
3. 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. Manual Control Stations, Electric Operation: Metal enclosure, labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.

C. Panel Components:

1. Power supply.
2. Battery charger.
3. Standby batteries.
4. Field-wiring terminal strip.
5. Electrically supervised solenoid valves and polarized fire-alarm bell.
6. Lamp test facility.
7. Single-pole, double-throw auxiliary alarm contacts.
8. Rectifier.

2.10 PRESSURE GAUGES

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. AGF Manufacturing, Inc.
2. AMETEK, Inc.
3. Brecco Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gauge Range: 0 to 300 psig.

E. Label: Include "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 INSTALLATION OF PIPING

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. 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 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. In seismic-rated areas, refer to Section 210548 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment."

M. Install pressure gauges on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gauges with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal and install where they are not subject to freezing.

N. Pressurize and check preaction sprinkler system piping, air-pressure maintenance devices and air compressors.

O. Fill sprinkler system piping with water.

P. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing. Comply with requirements for heating cables in Section 210533 "Heat Tracing for Fire-Suppression Piping" and for piping insulation in Section 210700 "Fire-Suppression Systems Insulation."

Q. 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."

R. 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."

S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.3 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. 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.

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. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

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 NFPA 13 or NFPA 13R for supports.

3.5 INSTALLATION OF VALVES AND SPECIALTIES

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 alarm valves with bypass check valve and retarding chamber drain-line connection.

3. Install deluge valves in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gauges, priming chamber attachment, and fill-line attachment.

E. Air Vent:

1. Provide at least one air vent at high point in each wet-pipe sprinkler system in accordance with NFPA 13 requirements. Connect vent into top of fire sprinkler piping.
2. Provide dielectric union for dissimilar metals, ball valve, and strainer upstream of automatic air vent.
3. Pipe from outlet of air vent to drain.

3.6 INSTALLATION OF SPRINKLERS

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.7 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13. Comply with requirements for identification specified in Section 210553 "Identification for Fire-Suppression Piping and Equipment”.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.8 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. 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.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports in accordance with NFPA.

3.9 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.

3.10 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain sprinkler system components.

3.11 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 or grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints. Where piping between fire department connection and check valve is routed below grade, piping and fittings shall also be externally coated and wrapped per AWWA C203 or C105.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Standard-Pressure, Wet-Pipe Sprinkler System, NPS 1-1/2 and smaller, shall be one of the following:

1. Standard-weight, Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.

D. Standard-Pressure, Wet-Pipe Sprinkler System, NPS 2 and Larger, shall be one of the following:

1. Standard-weight, Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, Schedule 40, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.
4. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
5. Schedule 10, black-steel pipe with plain ends; welding fittings; and welded joints.

E. High-Pressure, Wet-Pipe Sprinkler System, [All Sizes], to Be One of the Following:

1. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.

3.12 SPRINKLER SCHEDULE

A. Use sprinkler types as indicated on Fire Protection Contract Drawings.

END OF SECTION 211313

SECTION 22 0500

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. These basic requirements apply to all Division 22000 Sections.

B. The work of this Section consists of providing of all materials, labor and equipment and the like necessary and/or required for the complete execution of all Plumbing and related work for this project, as required by the contract documents.

1.02 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 REFERENCES

A. ASHRAE – American Society of Heating, Refrigerating and Air Conditioning Engineers Guides and Standards, latest editions.
B. ASPE - American Society of Plumbing Engineers.
C. UL - Underwriters Laboratory.
D. NFPA - National Fire Protection Association.

1.04 REGULATORY REQUIREMENTS

A. IECC 2015
B. IPC 2015
C. IFGC 2015
D. NY State SED Manual of Planning Standards – Current Addition

1.05 QUALITY ASSURANCE

A. The Contractor shall have the work indicated on the drawings and/or specified in each section performed by vendors or mechanics experienced and skilled in its implantation or by a “Specialist”, “Specialty Contractor” or “Specialty Subcontractor” under contractual agreement with the Contractor. These terms mean an individual or firm of established reputation, or, if newly organized, whose personnel have previously established a reputation in the same field, which is regularly engaged in, and which maintains a regular force of workmen skilled in either manufacturing or fabricating items required by the Contract, installing items required by the Contract, or otherwise performing work required by the Contract.

B. Where the Contract Specifications require installation by a "Specialist," that term shall also be deemed to mean either the manufacturer of the item, an individual or firm licensed by the manufacturer, or an individual or firm who will perform such work under the manufacturer's direct supervision.

1.06 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare drawings showing proposed arrangement of Work to meet Project conditions, including changes to Work specified in other Sections.

1.07 SCOPE OF WORK

A. This Contractor shall be responsible for coordinating his work with all other trades.

B. The Contractor shall provide all materials, labor, equipment, tools, appliances, services, hoisting, scaffolding, supervision and overhead for the furnishing and installing of all Plumbing work indicated on plan and in the specifications and related work including but not limited to the following:

- Sump Pumps
- Domestic Water Recirculation Pumps
- Domestic Hot Water Heaters and Expansion tanks
- Plumbing Fixtures
- Piping, Valves and fittings and specialties
  - Domestic systems
  - Drain, Waste, and Vent
  - Gas
  - Storm
- Hangers and Supports
- Backflow Preventers
- Equipment Insulation
- Pipe Insulation
- Identification
- Coordination
- Phasing
- Shop Drawings
- As-Built Drawings and Maintenance Manuals
- Warrantees

PART 2 - PRODUCTS – NOT USED

PART 3 – EXECUTION

3.1 GENERAL

A. Construct all apparatus of materials and pressure ratings suitable for the conditions encountered during continuous operation.

B. Where corrosion can occur, appropriate corrosion resistant materials and assembly methods must be used including isolation of dissimilar metals against galvanic interaction. Resistance to corrosion must be achieved by the use of the appropriate base

materials. Coatings shall be restored to only when specifically permitted by the Specification.

C. Construct all equipment in accordance with requirements of all applicable codes. All pressure vessels and safety devices that fall within the scope of the ASME Code shall conform to the Code and bear the ASME label or stamp.

E. Match and balance all system components to achieve compatibility of equipment or satisfactory operation and performance throughout the entire operating temperature and control ranges. All installations shall be in accordance with manufacturer's recommendations.

F. Provide all controls, wiring, piping, valves, accessories and other components necessary to make all systems complete and operable.

G. The contractor shall warranty all work, including labor and materials, and equipment furnished and installed as part of this contract for a minimum period of year from the date of acceptance by the owner, in writing. Certain equipment, such as underground fuel tanks, may have longer warranties as indicated in the specifications. In such cases the longer of the two warranties shall prevail.

3.2 SHOP DRAWINGS AND SUBMITTALS (COORDINATE WITH DIVISION 1)

A. Shop drawings and samples shall be prepared and submitted in accordance with the requirements established in the contract and shall consist of the all items listed in the following paragraph.

B. Manufacturer's data or shop drawings giving full information as to dimensions, materials, and all information pertinent to the adequacy of the submitted equipment shall be submitted for review. Shop drawings shall include, but not be limited to the following:

C. Submit all equipment noted and scheduled on plans including but not limited to the following:

- Ejector and sump pumps
- Domestic Water Recirculation Pumps
- Domestic Hot Water Heaters and Expansion tanks
- Hot water heater
- Gas booster
- Plumbing Fixtures
- Piping, Valves and fittings and specialties
  - Domestic systems
  - Drain, Waste, and Vent
  - Gas
  - Storm
- Hangers and Supports
- Backflow Preventers
- Equipment Insulation
- Pipe Insulation

- Hangers and Inserts
- Roof Drains
- Floor Drains
- Insulation
- Piping Layout (3/8 scale)
- Controls

D. The contractor shall, upon award, submit a schedule for the engineer's review indicating when each of the above shop drawings shall be submitted. Submittals shall be made in a timely manor as the project progresses in accordance with the Construction manager or General contractor's work schedules. The contractor shall allow sufficient time for the engineers to perform his review. A minimum of 10 business days shall be required. Untimely submittals shall be cause for the owner to make a delay against the contractor.

E. Demolition, purchase and or installation shall not begin until shop drawings pertaining to the equipment associated with any related potion of the work have been submitted.

F. Coordination shop drawings shall indicate all new lights, walls, piping, ductwork, structural elements, existing work, etc. and dimension locations of plumbing piping including elevations in relation to these items.

G. Where shop drawings have been reviewed by the Engineer, such review shall not be considered as a guarantee of measurements or building conditions. Where drawings have been reviewed, said review does not mean that drawings have been checked in detail; said review does not substantiate any quantities and in any way relieve the Contractor from his responsibility nor the necessity of furnishing materials or performing work required by the Contract Drawings and Specifications.

H. Where substitutions are submitted for approval, the review shall be for general performance comparison to the specified product. Products shall not be reviewed for size, clearance or coordination with other trades. Coordination with other trades shall be the responsibility of the contractor. And changes to existing conditions or changes required to the work of other trades such as a result of substituted material or equipment approved or not shall be the responsibility of this contractor.

I. Approval of shop drawings

1. The Contractor shall be specifically responsible for checking equipment dimensions and clearances and confirming that equipment will fit into the designated space and connect properly to adjoining equipment and/or materials.

2. Submittals marked "Make Corrections Noted" give authority to proceed in accordance with the notes. However, if drawings are also marked "Amend and Resubmit", corrected drawings must be resubmitted for final review.

3. Submittals marked "Rejected" do not give authority to proceed with any portion of the work shown there-on. Drawings must be resubmitted.

4. Submittals marked "Rejected" or "Amend and Resubmit" shall include a specific written response to the engineer's comments. Resubmission of a submittal without a written response to the engineer's comments will be considered incomplete and shall be returned un-reviewed.

3.3 CHARTS AND TAGS

A. The Contractor shall provide three sets of charts and diagrams of all piping systems indicating the number and location of valves, etc.

B. All valves, and controls shall be designated with brass tags. Refer to section 22 05 23 Identification for HVAC Piping and equipment

C. General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section

3.4 CODES AND STANDARDS

A. All equipment and installation methods shall conform to the applicable standards and/or recommendations set forth in but not limited to the following:
- IECC 2015
- IPC 2015
- IFGC 2015
- NY State SED Manual of Planning Standards – Current Addition

B. As well as all applicable referenced standards.

3.5 FEES & PERMITS

A. The Contractor shall obtain all permits and pay all fees required for his work.

3.6 PAINTING

A. All piping shall be painted in colors conforming with OSHA Standards.
B. All hangers, nuts bolts and fasteners shall be galvanized steel or nickel plated supports shall be painted

3.7 RIGGING

A. Furnish all labor, materials and equipment required to rig equipment and materials.

D. The rigger shall secure any necessary permits and comply with all applicable Federal, State and local safety regulations. A copy of permits to be kept at both the project site and Engineer's Office.

E. The rigger shall have a minimum of five (5) years of practical experience and hold a master riggers license if required.

F. The procedure for rigging shall be submitted to the Engineer for review. All possible precautions should be taken to prevent damage to the structure, streets, sidewalks, curbs, lawns, etc.

3.7 CUTTING AND PATCHING

A. All cutting and patching required for piping, etc., passing through walls, floors, and roof shall be provided by the General Contractor under this contract unless otherwise noted. This Contractor shall be responsible for any damage done to the structure due to his negligence.

B. Patching materials and application shall match existing construction.

C. Where applicable, new holes for piping installation shall be core drilled.

D. Pipe Sleeves & Fire-stopping

1. Provide for all pipes and other elements passing through floors, walls, partitions and structural elements, sleeves as specified. Sleeves shall be of adequate diameter to allow for a minimum of 3/4 inches clear all around sleeve and pipe.
2. Where pipes penetrate fire rated assemblies, or where holes or voids are created to extend systems through fire rated assemblies (walls, floors, ceilings, structure, etc.); sleeves and fire-stopping systems shall be installed.

G. Furnish access doors, to the General Contractor for installation where required in finished walls, partitions and the like for access to junction boxes, controls, valves, etc, concealed behind finished construction.

3.8 PROTECTION-COORDINATE WITH DIVISION 1

A. Recommendations and Provisions of ANSI Bulletin A10.2 and OSHA shall be complied with in-so-far as applicable to the work.

C. The Contractor shall provide temporary partitions or tarpaulins to protect adjacent spaces and/or equipment. He shall be responsible for any damage or injury to person or property of any character resulting from any act, omission, neglect or misconduct in his manner or method of executing his work.

D. The Contractor shall restore at his own expense such property to a condition similar or equal to that existing before such damage or injury in an acceptable manner.

E. The Contractor, furthermore, shall conduct his operations in such a manner as to prevent dust and debris from transferring on to adjoining property or into existing spaces.

F. All openings cut in walls, floors, roof or ceilings of the building, for pipe, etc., shall be closed off with box-type temporary protective enclosures of ¼" tempered hardboard, except when mechanics are actually working at the particular opening. Enclosures shall be constructed of fireproof 2x4 frame, four (4) sides covered and made completely dust and watertight.

G. All finished floor areas through which the contractor must pass with materials or equipment shall be protected with a layer of ¼" hardboard, "Masonite", laid with joints taped together.

3.9 EQUIPMENT SUPPORTS

A. Provide supplementary steel dunnage, curbs, angle iron stands, etc., to properly set and install all equipment, including supports necessary to properly pitch piping.

3.10 WELDING SOLDERING BRAZING

A. All equipment shall conform to the American Welding Society's Code for Welding in Building Construction, latest edition as well as state and local laws and ordinances.

B. The handling and storage of all welding materials, acetylene and oxygen tanks, burners, and other equipment required for the execution of welding and cutting work shall be subject at all times to the approval of the Owner and/or Architect. All welding materials and gas tanks shall be promptly removed from the premises upon completion of each day's work or stored in a manner satisfactory to the owner. Welding and equipment shall conform to the American Welding Society's Code for Welding in Building Construction, latest edition as well as state and local laws and ordinances.

C. Provide all temporary exhaust, and ventilation air systems required during welding operations as required by OSHA. At no time shall the owner's new or existing HVAC equipment be used for ventilation during construction.

2.11 AS-BUILT DRAWINGS

A. The Contractor shall provide a complete set of As-Built drawings showing actual installation and locations of all piping and roof drains.

B. As-Built drawings shall be submitted as per contract requirements in accordance with Division 1.

3.12 CONDITIONS

A. Inspection: Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that the work of this Section may be completed in strict accordance with all pertinent codes and regulations, the approved Shop Drawings, and the Manufacturers' recommendations.

B. Discrepancies: In the event of discrepancy, immediately notify the Engineer. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.13 INSTALLATION OF EQUIPMENT

A. Locations: Install all equipment in the locations shown on the approved Shop Drawings except where specifically otherwise approved on the job by the Owner and/or Engineer.

B. Interferences: Avoid interference with structure, and with work of other trades, preserving adequate headroom and clearing all doors and passageways to the approval of the Engineer.

C. Inspection: Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, and that all items function properly, and that all adjustments have been made.

3.14 CLOSING-IN OF UNINSPECTED WORK

A. General: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and accepted by the Engineer and by all other authorities having jurisdiction.

B. Uncovering: Should any of the work of this Section be covered up or enclosed before it has been completely inspected, tested, and approved, do all things necessary to uncover all such work. After the work has been completely inspected, tested, and approved, provide all materials and labor necessary and make all repairs necessary to restore the work to its original and proper condition at no additional cost to the owner.

3.15 BUILDING ACCESS

A. The Contractor shall inform himself fully regarding peculiarities and limitations of space available for the passage and installation of all equipment and materials under the Contract.

B. Verify and coordinate removal of existing construction to suit conditions. Provide all labor and material to facilitate installation.

3.16 COOPERATION WITH OTHER TRADES / PHASING

A. Cooperate with other trades in order that all systems in the work may be installed in the best arrangements.

D. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.

E. This Contractor shall submit fully coordinated shop drawings showing all piping, ductwork and equipments, as well as relevant work of all other trades such as light, conduits, structural and steel, which may impact the final size or placement of piping, roof drains, etc.

F. The work shall be scheduled and phased in accordance with the requirements of the contract and the client. Prior to the commencement of work the PLUMBING contractor shall submit a schedule in writing to the Architect and owner for approval. There shall be no shutdowns of any systems without prior written approval from the owner. The contractor shall include in his bid all costs associated with providing temporarily piping, pumps, hot water heaters, to maintain operations outside the area of work while work is being performed. It shall also be noted that piping will have to be extended through the other areas in order to reach the area(s) under construction as part of this work. The contractor shall include in his bid all provisions to perform such phasing work. This note is typical for phases.

3.17 CLEANING

A. It is the intent of the contract documents that all work, including the inside of equipment be left in a clean condition. All construction dirt shall be removed from material and equipment.

B. All removed items shall be taken off the premises and discarded in a manner satisfactory to the Owner.

3.18 COMPLETENESS

A. It is the intent of the contract documents to provide complete systems. Completeness shall mean not only that all material and equipment has been installed properly, but that all material and equipment is installed, adjusted, and operating as per the design intent in the opinion of the Engineer.

3.19 FIRE PREVENTION DURING HOT WORK

A. Before starting operations, the Contractor shall furnish trained personnel to provide fire watches for locations where hot work is to be performed. One fire watcher may observe several locations in a relatively small contiguous area. Contractor shall furnish suitable type, fully-charged, operable portable fire extinguisher to each fire watcher.

B. The Contractor shall provide fire watchers who know how to operate the fire extinguisher, how to turn on a fire alarm and how to summon the fire department.

C. Before starting operations, take suitable precautions to minimize the hazard of a fire communicating to the opposite side of walls, floors, ceilings and roofs from the operations.

3.22 SAFETY MEASURES

A. Hot work shall not be done in or near rooms or areas where flammable liquids or explosive vapors are present or thought to be present. A combustible gas indicator (explosimeter) test shall be conducted to assure that each area is safe. The Contractor is responsible for arranging and paying for each test.

B. Insofar as possible, the Contractor shall remove and keep the area free from all combustibles, including rubbish, paper and waste within a radius of 25 feet from hot operations.

C. If combustible material cannot be removed, the Contractor shall furnish fireproof blankets to cover such materials. At the direction of the owner floors, walls, and ceilings of combustible material shall be wetted thoroughly with water before, during, and after operations sufficiently to afford adequate protection.

D. Where possible, the Contractor shall furnish and use baffles of metal or gypsum board to prevent the spraying of sparks, hot slag and other hot particles into surrounding combustible material.

E. The Contractor shall prevent the spread of sparks and particles of hot metal through open windows, doors, and holes and cracks in floors, walls, ceilings and roofs.

F. Cylinders of gas used in hot work shall be placed a safe distance from the work. The Contractor shall provide hoses and equipment free of deterioration, malfunction and leaks. Suitable supports shall be provided to prevent accidental overturning of cylinders. All cylinder control valves shall be shut off while in use with the gas pressure regulator set at 15 psi or less.

G. When hot work operations are completed or ended for the day, each location of the days work shall be inspected by the Contractor 30 to 60 minutes after completion of operations to detect for hidden or smoldering fires and to ensure that proper housekeeping is maintained. Contractor shall cleanup the area of work at the end of each shift or workday.

H. Where sprinkler protection exists, the sprinkler system shall be maintained without interruption while operations are being performed. If operations are performed close to automatic sprinkler heads, gypsum board sheets or damp cloth guards may be used to shield the individual heads temporarily. The heads shall be inspected by the Contractor immediately after hot work operations cease, to ensure all materials have been removed from the heads and that the heads have not been damaged.

I. Suitable type, fully charged, operable portable fire extinguisher shall be available at all times during hot work operations.

J. If any of the above safeguards are not employed, or are violated, the Contracting owners Representative may, by written notice, stop the work until compliance is obtained. Such stoppage shall not relieve the Contractor form performing his work within the Contract period for the Contract price.

3.23 USE OF OWNERS EQUIPMENT

A. The contractor shall not use any the owner’s HVAC system or equipment, new or existing, for any purpose. The contractor shall provide temporary HVAC equipment, ductwork, power, and controls for use during construction for the purpose of ventilation, or heating during the construction process. All such equipment, ductwork, power, and controls shall be removed and the completion of work.

END OF SECTION

SECTION 22 0517

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. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials

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 80, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 80, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

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. Smith, Jay R. Mfg. Co.
2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20 psig minimum.
3. Sealing Elements: EPDM-rubber or Nitrile (Buna N) interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
4. Pressure Plates: Carbon steel, Stainless steel, Stainless steel, Type 316.
5. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, ASTM B 63,3 Stainless steel, Stainless steel, Type 316 of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

B. Rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.6 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. Premixed and factory packaged.

C. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls. Sleeves for building service piping shall be one nominal line size larger than the service pipe.

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, and concrete walls as new slabs and walls are constructed.
1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. 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 Division 07 Section "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 Division 07 Section "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Division 07 Section "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.3 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.

3.4 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. Use grout to seal the space around outside of sleeve-seal fittings.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 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: Steel pipe sleeves Sleeve-seal fittings.
b. Piping NPS 6 and Larger: Cast-iron pipe sleeves, or Steel pipe sleeves with Sleeve-seal fittings.

2. Exterior Concrete Walls below Grade:

    a. Piping Smaller Than NPS 6: Steel pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch minimum annular clear space between piping and sleeve for installing sleeve-seal system.

    b. Piping NPS 6 and Larger: Cast-iron pipe sleeves with sleeve-seal system or Steel pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch minimum annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

    a. Piping Smaller Than NPS 6: Steel pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch minim annular clear space between piping and sleeve for installing sleeve-seal system.

    b. Piping NPS 6 and Larger: Cast-iron pipe sleeves with sleeve-seal system or Steel pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch minimum annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

    a. Piping Smaller Than NPS 6: Steel pipe sleeves or Stack-sleeve fittings.
    b. Piping NPS 6 and Larger: Steel pipe sleeves or Stack-sleeve fittings.

5. Interior Partitions:

    a. Piping Smaller Than NPS 6: Steel pipe sleeves.
    b. Piping NPS 6 and Larger: Galvanized-steel sheet sleeves.

END OF SECTION

SECTION 22 0518

ESCUTCHEOUNS 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 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.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. 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 insulated 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. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
g. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

2. Escutcheons for Existing Piping: (not used)

a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
e. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge.
f. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed 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.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 22 0519

METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.
6. Test plugs.
7. Test-plug kits.
8. Sight flow indicators.

B. Related Requirements:
1. Section 221119 "Domestic Water Piping Specialties" for water meters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Trerice, H. O. Co.
2. WATTS.
3. Weiss Instruments, Inc.

4. Weksler Glass Thermometer Corp.

2.2 BIMETALLIC-ACTUATED THERMOMETERS

A. Standard: ASME B40.200.

B. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch nominal diameter.

C. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F and deg C.

D. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

E. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

F. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

G. Window: Plain glass.

H. Ring: Stainless steel.

I. Element: Bimetal coil.

J. Pointer: Dark-colored metal.

K. Accuracy: Plus, or minus 1 percent of scale range.

2.3 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Standard: ASME B40.200.

2. Case: Cast aluminum; 6-inch nominal size.
3. Case Form: Back angle unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.
5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.
6. Window: Glass or plastic.
7. Stem: Aluminum or brass and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

8. Connector: 3/4 inch, with ASME B1.1 screw threads.
9. Accuracy: Plus, or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

B. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
1. Standard: ASME B40.200.

2. Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
3. Case Form: Adjustable angle unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.
5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.
6. Window: Glass.
7. Stem: Aluminum and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
9. Accuracy: Plus, or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.4 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES CSA.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.5 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Standard: ASME B40.100.
2. Case: Liquid-filled AND Sealed Solid-front, pressure relief type(s); cast aluminum or drawn steel; 6-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Brass OR Stainless steel.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

B. Remote-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Standard: ASME B40.100.

2. Case: Liquid-filled and Sealed type; cast aluminum or drawn steel; 4-1/2-inch OR 6-inch nominal diameter with back or front flange and holes for panel mounting.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Stainless steel.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.6 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass ball Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.7 TEST PLUGS

A. Description: Test-station fitting made for insertion into piping tee fitting.

B. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

C. Thread Size: or NPS 1/2, ASME B1.20.1 pipe thread.

D. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

E. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.8 TEST-PLUG KITS

A. Furnish one test-plug kit(s) containing one thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

B. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

C. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

D. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

E. Carrying Case: Metal or plastic, with formed instrument padding.

2.9 SIGHT FLOW INDICATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ARCHON Industries, Inc.
2. Dwyer Instruments, Inc.
3. Ernst Flow Industries.
4. John C. Ernst Co., Inc.

B. Description: Piping inline-installation device for visual verification of flow.

C. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.

D. Minimum Pressure Rating: 150 psig.

E. Minimum Temperature Rating: 200 deg F.

F. End Connections for NPS 2 and Smaller: Threaded.

G. End Connections for NPS 2-1/2 and Larger: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install test plugs in piping tees.

K. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.

L. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.
4. Downstream of back flow preventer.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 PRESSURE GAGE AND THERMOMETER SCHEDULE

A. Install large size thermometers wherever space is available. Where space is limited or use compact style.

B. Install all pressure gages locally unless space does not permit, or the location is not readily visible. Then use remote reading pressure gage and install in location accessible and readily visible, as close to the point of reading as possible.
1. Test plug with EPDM self-sealing rubber inserts.

C. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping: 30 to 240 deg F.

C. Scale Range for Domestic Cooled-Water Piping: 0 to 100 deg F.

3.6 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 200 psi.

B. Scale Range for Domestic Water Piping: 0 to 160 psi.

C. Scale Range for Domestic Water Piping: 0 to 300 psi.

END OF SECTION

SECTION 22 0523

GENERAL-DUTY VALVES OR 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. Brass ball valves.
2. Bronze lift check valves.
3. Bronze swing check valves.
4. Bronze gate valves.
5. Iron gate valves.
6. Bronze globe valves.
7. Iron globe valves.

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
3. Division 33 water distribution piping Sections for general-duty and specialty valves for site construction piping.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Non-rising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

D. Every pipe, fixture, and fitting used to convey water for potable use shall contain less than 0.25% of lead by weight according to lead free law "reduction of lead in drinking water act", nsf/ansi standard 372.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set gate valves closed to prevent rattling.
4. Set ball valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
1. Handwheel: For valves other than quarter-turn types.

2. Handlever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Seats: PTFE or TFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

B. Two-Piece, Regular-Port, Brass Ball Valves with Brass Trim:

1. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Seats: PTFE or TFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Regular.

2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. Iron, Single-Flange Butterfly Valves with EPDM or NBR Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crane Co.; Crane Valve Group; Jenkins Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. NIBCO INC.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 250 psig.
   c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
   d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
   e. Seat: EPDM or NBR.
   f. Stem: One- or two-piece stainless steel.
   g. Disc: Aluminum bronze.

2.4 IRON, GROOVED-END BUTTERFLY VALVES

A. Iron, Grooved-End Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Kennedy Valve; a division of McWane, Inc.
   b. Shurjoint Piping Products.
   c. Tyco Fire Products LP; Grinnell Mechanical Products.
   d. Victaulic Company.

2. Description:

   a. Standard: MSS SP-67, Type I.
   b. CWP Rating, NPS 8 and Smaller: 300 psig.
   c. CWP Rating, NPS 10 and Larger: 200 psig.
   d. Body Material: Coated, ductile iron.
   e. Stem: Two-piece stainless steel.
   f. Disc: Coated, ductile iron.
   g. Seal: EPDM.

2.5 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Crane Co.; Crane Valve Group; Jenkins Valves.
    c. Crane Co.; Crane Valve Group; Stockham Division.

2. Description:

    a. Standard: MSS SP-80, Type 2.
    b. CWP Rating: 200 psig.
    c. Body Design: Vertical flow.
    d. Body Material: ASTM B 61 or ASTM B 62, bronze.
    e. Disc: Bronze.

2.6 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Crane Co.; Crane Valve Group; Jenkins Valves.
    c. Crane Co.; Crane Valve Group; Stockham Division.
    d. Milwaukee Valve Company.
    e. NIBCO INC.
    f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

    a. Standard: MSS SP-80, Type 3.
    b. CWP Rating: 200 psig.
    c. Body Design: Horizontal flow.
    d. Body Material: ASTM B 62, bronze.
    e. Disc: Bronze.

2.7 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Crane Co.; Crane Valve Group; Jenkins Valves.
    c. Crane Co.; Crane Valve Group; Stockham Division.
    d. Milwaukee Valve Company.
    e. NIBCO INC.

f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

2.8 IRON GATE VALVES

A. Class 150, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Milwaukee Valve Company.
e. NIBCO INC.

f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

B. Class 250, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. CWP Rating: 500 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

2.9 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.

b. CWP Rating: 200psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Bronze, PTFE, or TFE
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

2.10 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

2.11 LUBRICATED PLUG VALVES

A. Plug valves are specified in Specification section 221114 Natural gas piping

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 check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Lift Check Valves: With stem upright and plumb.

F. All valves used in any system shall have a pressure class that exceeds the pressure of the system it is installed in.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated on plan, use the following:

1. Shutoff Service: Ball, butterfly, or gate valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.

3. Throttling Service: Globe or ball valves.
4. Pump-Discharge Check Valves:

a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
b. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
5. For Grooved-End Copper Tubing and Steel Piping: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Brass Valves: May be provided with lead free solder-joint ends instead of threaded ends.
2. Ball Valves: Two-piece, full port, brass with brass trim. Class 150
3. Bronze Swing Check Valves: Class 150, bronze disc.
4. Bronze Gate Valves: Class 150.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM, NBR seat, aluminum-bronze disc.
3. Iron, Grooved-End Butterfly Valves: 175 CWP.
4. Iron Gate Valves: Class 150.

3.6 SANITARY WASTE AND STORM-DRAINAGE VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Swing Check Valves: Class 150, nonmetallic disc.
3. Bronze Gate Valves: Class 150.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron Gate Valves: Class 150.
3. Iron Swing Check Valves: Class 150.
4. Iron Globe Valves: Class 150.

END OF SECTION

SECTION 22 0529

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. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe stands.
6. Pipe positioning systems.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 fire-suppression piping Sections for pipe hangers for fire-suppression piping.

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 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.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Sustainable Design Submittals:
   1. Environmental Product Declaration: For each product.
   2. Health Product Declaration: For each product.
   3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings: 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. Fiberglass strut systems.
   4. Pipe stands.

D. 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.

E. Welding certificates.

1.6 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.

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: Pre-galvanized 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.

B. Copper Pipe Hangers:

   1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.

2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel or stainless 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 THERMAL-HANGER SHIELD INSERTS

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. National Pipe Hanger Corporation.
2. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
3. Rilco Manufacturing Co., Inc.
4. Other manufacturers offering equivalent products.

B. 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.

C. 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.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 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, zinc-coated 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.

2.5 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

2.6 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.7 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.

2.8 VIBRATION ISOLATION HANGERS

A. Vibration isolation pipe hangers; pre-compressed and locked at the rated deflection by means of a resilient up-stop to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a drawing of the hanger showing the 30° capability. Hangers shall be type PC30N as manufactured by Mason Industries, Inc

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. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. 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.

E. Pipe Stand Installation:

1. Pipe Stand: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. 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.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. 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.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. 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.

M. 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.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/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.

3.3 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 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.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.5 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 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, and metal trapeze pipe hangers and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. 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.

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: 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.

L. 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.
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.

M. 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.

N. 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.

9. Install vibration isolation hangers on all piping connected to motor driven equipment for a distance of 20’ or the first two hangers.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 22 0553

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 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: Brass 0.032-inch, stainless steel 0.025-inch, aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Letter Color: Black, Blue, Red, White, Yellow. As per ANSI depending on service
3. Background Color: Black, Blue, Red, White, Yellow as per ANSI depending on service
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-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: Black, Blue, Red, White, Yellow as per ANSI depending on service
3. Background Color: Black, Blue, Red, White, Yellow ANSI depending on service
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: Black.

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.

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 Paint: Exterior, gloss, black unless otherwise indicated. Paint may be in pressurized spray-can form.
2. Identification Paint: Exterior, 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: Brass, 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 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 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting."

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 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.
6. Spaced at maximum intervals of 50 feetalong 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. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

E. Pipe Label Color Schedule:

1. Low-Pressure Compressed Air Piping:

a. Background: Safety blue.
b. Letter Colors: White.

2. High-Pressure Compressed Air Piping:

a. Background: Safety blue.
b. Letter Colors: White.

3. Domestic Water Piping

a. Background: Safety green.
b. Letter Colors: White.

4. Sanitary Waste and Storm Drainage Piping:

a. Background Color: Safety black
b. Letter Color: White

3.3 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.
c. Sanitary waste and storm drainage: 1-1/2 inches round.

2. Valve-Tag Color:

a. Cold Water: Green.
b. Hot Water: Green.
c. Sanitary waste and storm drainage: Natural.

3. Letter Color:

a. Cold Water: White.
b. Hot Water: White.

c. Sanitary waste and storm drainage: white.

3.4 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 22 0719

PLUMBING PIPING INSULATION AND JACKETS

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.
3. Domestic recirculating hot-water piping.
4. Sanitary waste piping exposed to freezing conditions.
5. Storm-water piping exposed to freezing conditions.
6. Roof drains and rainwater leaders.
7. Supplies and drains for handicap-accessible lavatories and sinks.

B. Related Sections:

1. Section 221116 "Domestic 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, 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 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.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
2. Jacket Materials for Pipe: 12 inches long by NPS 2.
3. Sheet Jacket Materials: 12 inches square.

4. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

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 Section 220529 "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.

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, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pittsburgh Corning Corporation; Foamglass.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA, Inc.; Aerocel.

b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, 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.

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. 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 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Ramco Insulation, Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Ramco Insulation, Inc.; Thermokote V.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 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. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.

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).

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

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 Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.

4. Flame-spread index shall be 25 or less and smoke-developed index shall be 50 or less as tested in accordance with ASTM E84.
5. Wet Flash Point: Below 0 deg F .
6. Service Temperature Range: 40 to 200 deg F.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. 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).

E. 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, available products that may be incorporated into the Work include, but are not limited to, 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).

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

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).

2.4 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass and Phenolic Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
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).

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   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).

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. 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).

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.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

a. Sheet and roll stock ready for shop or field sizing.
b. Finish and thickness are indicated in field-applied jacket schedules.

Among the three moisture barriers in first subparagraph below, 1-mil (0.025-mm) barrier provides the least protection against galvanic corrosion, 3-mil (0.075-mm) barrier offers better protection, and polysurlyn barrier offers the best protection. For most indoor applications, 1-mil (0.025-mm) barrier is adequate. For outdoor applications, select either 3-mil (0.075-mm) or polysurlyn barrier.

c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
d. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. 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, available products that may be incorporated into the Work include, but are not limited to, 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, available products that may be incorporated into the Work include, but are not limited to, 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, available products that may be incorporated into the Work include, but are not limited to, 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, available products that may be incorporated into the Work include, but are not limited to, 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.
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, available products that may be incorporated into the Work include, but are not limited to, 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.
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, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping and Seals.

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.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 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.

2.9 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
   b. McGuire Manufacturing.
   c. Truebro; a brand of IPS Corporation.
   d. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, 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. 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 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.

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. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, 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.

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 beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. 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 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 below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at 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.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. 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 Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate 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, 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.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. 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 cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 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.

3.9 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.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

A. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

B. Do not field paint aluminum or stainless-steel jackets.

3.11 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, 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.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. Smaller than NPS 1 ½": Insulation shall be one of the following:

a. Cellular Glass: ½ inches thick.
b. Flexible Elastomeric: ½" inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1 1/2 and Larger: Insulation shall be one of the following:

a. Cellular Glass: 1" inches thick.
b. Flexible Elastomeric: 1" inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1" inch thick.

B. Domestic Hot and Recirculated Hot Water: (T < 140° F)

1. Smaller than NPS 1 ½": Insulation shall be one of the following:

a. Cellular Glass: 1 inch thick.
b. Flexible Elastomeric: 1 inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1 ½" and Larger: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Flexible Elastomeric: 1-1/2 inches thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inches thick.

C. Domestic Hot and Recirculated Hot Water: (T 141°F to 200° F)

1. Smaller than NPS 1 ½": Insulation shall be one of the following:

a. Cellular Glass: 11/2" inch thick.
b. Flexible Elastomeric: 1 ½" inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 11/2" inch thick.

2. NPS 1 ½" and Larger: Insulation shall be one of the following:

a. Cellular Glass: 2 inches thick.
b. Flexible Elastomeric: 2 inches thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

D. Roof Drain; bodies, storm risers and horizontal offsets inside building:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 11/2 inches thick.
b. Flexible Elastomeric: 1 inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

E. All Sanitary waste, storm and domestic piping in garages or areas not heated:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 2” inches thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inch thick.

F. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures not concealed by millwork:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Flexible Elastomeric: 1/2 inch thick cold water and drain, 1” hot water
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick old water and drain, 1” hot water
c. Jacket with protective shielding guards. Refer to section 2.9

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. ASJ

D. Piping, Exposed:

1. All exposed sanitary, waste, storm, hot water cold water, and vent piping and fittings which are exposed to view in public areas, particularly the Cafeteria, Stage, Gymnasium, Atrium, (as well as insulated piping in equipment rooms), shall be completely covered with white Zeston 2000 PVC insulated piping and fitting covers. Apply as per manufacturer with Perma Weld adhesive. All labels and flow arrows shall be applied over PVC jacket

END OF SECTION

SECTION 220800

COMMISSIONING OF PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes commissioning process requirements for electrical systems.

B. Related Sections:

1. 019113 – General Commissioning Requirements

2. Division 22 Sections

1.3 SCOPE

A. Commissioning requires the participation of Division 22, Plumbing, to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 019113. Division 22, Plumbing, shall be familiar with Section 019113 and the Commissioning Plan issued by the Commissioning Agent (CA) and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.4 SYSTEMS TO BE COMMISSIONED

A. The following Plumbing systems will be commissioned on this project:
1. Domestic Hot Water System

1.5 RESPONSIBILITIES

A. Commissioning responsibilities applicable to the Plumbing contractor of Division 22 are as described in Section 019113, Paragraph 1.10-I.

1.6 OPERATION AND MAINTENANCE (O&M) MANUALS

A. Compile and prepare documentation for all equipment and systems covered in Division 22, Plumbing, and deliver to Construction Manager for inclusion in O&M Manuals in accordance with Division 1.

B. Provide the Commissioning Agent with a copy of O&M Manuals for review.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Provide test equipment necessary to fulfill testing requirements of Division 22, Plumbing.

B. Refer to Section 019113 and other plumbing sections for additional Division 22, Plumbing requirements.

PART 3 - EXECUTION

3.1 PREFUNCTIONAL CHECKLISTS AND STARTUP

A. Prefunctional tests and checklists (PFT's) are important to ensure that the equipment and systems are connected properly and are operational. PFT's ensure that functional performance testing may proceed without unnecessary delays. The Contractor shall be responsible for performing Prefunctional testing. EVERY piece of equipment receives a full Prefunctional checkout.

B. Division 22, Plumbing, has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting design objectives of Contract Documents. Commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to CA or Owner.

3.2 FUNCTIONAL PERFORMANCE TESTS

A. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to completion of systems or sub-systems at discretion of CA and CM. Beginning system testing before full completion does not relieve Contractor from fully completing system as soon as possible, including prefunctional checklists.

B. Functional performance testing requirements are in addition to and do not replace any testing required by Code or listed elsewhere in Division 22.

C. Functional performance testing procedures will be performed on but not be limited to the following system types and equipment. Final functional testing requirements and procedures will be developed based on approved equipment shop drawings.

1. Domestic Water Heating System
    a. Equipment:
        1) Existing Domestic hot water heater
        2) Domestic hot water recirculation pump

3.3 ISSUES AND DEFICIENCIES

A. Refer to Section 019113 for details relating to resolution of issues and deficiencies.

3.4 TRAINING OF OWNER PERSONNEL

A. Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed. Refer to 019113 for details.

B. Duration of Training: Plumbing Contractor shall provide training on each piece of equipment according to the following schedule:

System	**Minimum Training Hours**
Domestic Hot Water System and Controls	2
Total Training Time	**2 Hours**

END OF SECTION 220800

SECTION 22 1114

FACILITY NATURAL-GAS AND PROPANE GAS 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. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Concrete bases.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 100 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping valves and specialties.
2. Corrugated, stainless-steel tubing with associated components.

3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Dielectric fittings.

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: 3/8 inch per foot.
2. Detail mounting, supports, and valve arrangements for pressure regulator assembly.

C. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.

D. Qualification Data: For qualified professional engineer.

E. Welding certificates.

F. Field quality-control reports.

G. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Steel Support 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.

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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.8 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than one week in advance of proposed interruption of natural-gas service.
2. Do not proceed with interruption of natural-gas service without Construction Manager's and Owner's written permission.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Division 08 Section "Access Doors and Frames."

C. Part 2 specifies general descriptions and minimum standards for pipe valves and fitting. All pipes valves fittings and specialties shall meet the requirements of the local utility and shall be listed and approved for use by the local utility.

D. The contractor shall be responsible for all utility coordination. This will include but is not limited to field supervision by the utility, applications to the utility for service. Submit application, arrange field meetings and inspections as required. HDPE piping fusion welding shall only be performed by contractors having current certification, (by the utility), for both personal and equipment. Before service work begins, determine service gas pressure, and obtain service layout from the utility. Required gas service pressure shall be coordinated with equipment requirements.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

a. Material Group: 1.1.
b. End Connections: Threaded or butt welding to match pipe.
c. Lapped Face: Not permitted underground.

d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

5. Mechanical Couplings:

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) Dresser Piping Specialties; Division of Dresser, Inc.
2) Smith-Blair, Inc.
3) Other manufacturers offering similar products.

b. Steel flanges and tube with epoxy finish.
c. Buna-nitrile seals.
d. Steel bolts, washers, and nuts.
e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

B. HDPE Pipe: ASTM D 2513, SDR 11. (Underground piping only)

1. HDPE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. HDPE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated, and leak tested.

a. Underground Portion: HDPE pipe complying with ASTM D 2513, SDR 11 inlet.
b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering.
c. Aboveground Portion: PE transition fitting.
d. Outlet shall be threaded or flanged or suitable for welded connection.
e. Tracer wire connection.
f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

4. Transition Service-Line Risers: Factory fabricated, and leak tested.

a. Underground Portion: HDPE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
b. Outlet shall be threaded or flanged or suitable for welded connection.
c. Bridging sleeve over mechanical coupling.
d. Factory-connected anode.
e. Tracer wire connection.

f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

5. Plastic Mechanical Couplings, NPS 1-1/2 and Smaller: Capable of joining PE pipe to PE pipe.

a. Manufacturers: Subject to approval of the utility and in compliance with requirements, provide products by one of the following:

1) Lyall, R. W. & Company, Inc.
2) Mueller Co.
3) Perfection Corporation.

b. PE body with molded-in, stainless-steel support ring.
c. Buna-nitrile seals.
d. Acetal collets.
e. Electro-zinc-plated steel stiffener.

6. Plastic Mechanical Couplings, NPS 2 and Larger: Capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

a. Manufacturers: Subject to approval by the utility and in compliance with utility requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Lyall, R. W. & Company, Inc.
2) Mueller Co.
3) Perfection Corporation.

b. Fiber-reinforced plastic body.
c. PE body tube.
d. Buna-nitrile seals.
e. Acetal collets.
f. Stainless-steel bolts, nuts, and washers.

7. Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

a. Manufacturers: Subject to approval by the utility and in compliance with utility requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following
1) Dresser Piping Specialties.
2) Smith-Blair, Inc.

b. Stainless-steel flanges and tube with epoxy finish.
c. Buna-nitrile seals.
d. Stainless-steel bolts, washers, and nuts.
e. Factory-installed anode for steel-body couplings installed underground.

2.2 PROTECTIVE COATING FOR UNDERGROUND STEEL PIPING:

A. All buried steel piping shall be catholically protected as per the following:

a. All buried steel pipe requires factory applied coating in accordance with gas specification g- 8062 titled “extruded polyolefin coating on steel gas pipe”.

b. Field installed joints and fittings will be coated in accordance with gas specification g-8209 titled “field coating of steel gas pipe and fittings installed underground and in subsurface structures”.

c. The new steel service pipe must have an insulating joint (ij) installed when a connection to existing steel or copper tubing is required.

d. An insulating joint (ij) will be installed under the following conditions:
   1) Low pressure service - after the service head valve (shv) but before the gas meter.
   2) Elevated pressure - after the gas regulator but before the gas meter.

e. Electrical continuity of all steel underground service pipes must be provided. Bonding must be installed across all compression couplings and fittings installed on buried service pipes as per gas drawing specification eo-4718 titled “bonding of compression couplings and valves on steel mains and services”.

f. Magnesium anodes are required on all new direct buried steel service pipes. Con Edison will furnish and install the required anodes on its portion of gas steel gas service pipe with the customer and/or his contractor responsible for the anode installation on the customer's portion of service pipe. All anode wires shall be a-fixed to the steel service pipe using the thermit welding process or by using an approved connector as per gas drawing specification eo-14134 titled “thermit weld process for attaching wire to pipe or fitting”.

PIPE SIZES	PIPE LENGTH	ANODE SIZE	QUANTITY
2"-4"	EVERY 100' OR LESS	32LB	1
6"-12"	EVERY 100' OR LESS	32LB	2

*REFER TO CON ED YELLOW BOOK FOR THE COMPLETE TABLE.

g. When a steel gas service is installed that supplies more than one building, the anodes shall be installed after Con Edison personnel has tested the pipe to determine the acceptability of the pipe coating.

h. Con Edison will test the catholic protection on all new gas service installations. Proper catholic protection must exist prior to the final tie-in by Con Edison.

i. Test stations shall be installed along with anodes on all buried steel service pipes greater than 100 ft or more in length. Anode test stations are to consist of #10 copper wire leads (white) thermit-welded to the steel service pipe along with anode leads (black) routed into a 4” x 4” box, flush to grade. Con Edison’s gas corrosion personnel will make final splice.

2. Mechanical Couplings:

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) Dresser Piping Specialties; Division of Dresser, Inc.
2) Smith-Blair, Inc.
3) Other manufacturers offering similar products.

b. Steel flanges and tube with epoxy finish.
c. Buna-nitrile seals.
d. Steel bolts, washers, and nuts.
e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

2.3 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Corrugated stainless-steel tubing with polymer coating.
3. Operating-Pressure Rating: 0.5 psig.
4. End Fittings: Zinc-coated steel.
5. Threaded Ends: Comply with ASME B1.20.1.
6. Maximum Length: 72 inches.
7. Corrugated Stainless Steel Piping (CSST) installation is not permitted on distribution piping in New York City.

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.4 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. BrassCraft Manufacturing Company; a Masco company.
b. Conbraco Industries, Inc.; Apollo Div.
c. Lyall, R. W. & Company, Inc.
d. McDonald, A. Y. Mfg. Co.
e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.

3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Lee Brass Company.
    b. McDonald, A. Y. Mfg. Co.
    c. .

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. McDonald, A. Y. Mfg. Co.
    b. Mueller Co.; Gas Products Div.
    c. Xomox Corporation; a Crane company.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.

9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.6 AUTOMATIC GAS SHUTOFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33. and UL listed guide #YRPV2.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves where indicated. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
5. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
6. Body; Aluminum
7. Seals and disc; NBR
8. Core tube; 305 stainless steel
9. Core and plugnut; 430F stainless
10. Springs; 302 stainless
11. Valves shall be normally closed, cable operated and held open. Coordinate operating mechanism with fire protection contractor and equipment. Mechanism shall be designed to close valve when cable is pulled or released as required

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38. and UL listed guide #YRPV2.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves where indicated.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.
5. Body; Aluminum
6. Seals and disc; NBR
7. Core tube; 305 stainless steel
8. Core and plugnut; 430F stainless
9. Springs; 302 stainless
10. Valves shall be normally closed, cable operated and held open. Coordinate operating mechanism with fire protection contractor and equipment. Mechanism shall be designed to close valve when cable is pulled or released as required.

2.7 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
a. American Meter Company.
b. Fisher Control Valves and Regulators; Division of Emerson Process Management.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 100 psig.

2.8 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Hart Industries International, Inc.
d. McDonald, A. Y. Mfg. Co.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
f. Wilkins; a Zurn company.

2. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 125 psig minimum at 180 deg F.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Matco-Norca, Inc.
    d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    e. Wilkins; a Zurn company.

2. Description:

    a. Standard: ASSE 1079.
    b. Factory-fabricated, bolted, companion-flange assembly.
    c. Pressure Rating: 125 psig minimum at 180 deg F.
    d. 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Description:

    a. Nonconducting materials for field assembly of companion flanges.
    b. Pressure Rating: 150 psig.
    c. Gasket: Neoprene or phenolic.
    d. Bolt Sleeves: Phenolic or polyethylene.
    e. Washers: Phenolic with steel backing washers.

2.9 LABELING AND IDENTIFYING

A. In accordance with ASME and Local utility requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 and the New York State Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 and the New York State Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and Con Edison requirements for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

C. Install fittings for changes in direction and branch connections.

D. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Division 23 Section "Meters and Gages for HVAC Piping."

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the New York State Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. 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.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. 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.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Verify final equipment locations for roughing-in.

K. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

L. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-regulator outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

M. Extend relief vent connections for service regulators to outdoors and terminate with weatherproof vent cap.

N. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

O. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

a. Exception: Tubing passing through partitions or walls does not require striker barriers.

2. Prohibited Locations:

a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
b. Do not install natural-gas piping in solid walls or partitions.

P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

Q. Connect branch piping from top or side of horizontal piping.

R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

S. Do not use natural-gas piping as grounding electrode.

T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. 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.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.8 CONNECTIONS

A. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

B. Install piping adjacent to appliances to allow service and maintenance of appliances.

C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

A. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 PAINTING

A. Comply with requirements in Division 09 painting Sections for painting interior and exterior natural-gas piping.

B. Paint exposed, interior and exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel (flat).
d. Color: yellow.

C. Paint exposed, interior metal piping, valves, service regulators, and piping specialties, except components, with factory-applied paint or protective coating.

D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Use 3000-psig, 28-day, compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.12 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to NFPA 54 and the New York Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

F. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.13 PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. PIPE SIZE AND PRESSURE LIMITATION FOR GAS PIPING

PSIG	Gas Pipe Installation
In Excess of ½ psig - 5	Gas distribution pipe operating size 4-inch or larger must be welded.
In Excess of 5 psig	All gas distribution pipes sizes operating above 5 psig must be welded.
All welding of gas distribution pipe shall be subject to DOB special inspection (NYCFGC Section.403)	

All piping 4-Inch or larger operating in excess of 5 psig must be butt-welded, Subject to DOB special inspection and radio-graphed
Threaded piping may be used up to 4-inch at pressure no greater than ½ psig.

B. Aboveground, branch piping smaller than 4" NPS and less than ½ psi shall be the following:
   1. Steel pipe with malleable-iron fittings and threaded joints.

C. All welded distribution piping shall be one of the following:
   1. Steel pipe with wrought-steel fittings and welded joints.

D. Underground, piping shall be one of the following:
   1. Steel pipe with wrought-steel fittings and welded joints.
   2. HDPE pipe and Fittings with fusion welded joints

E. All piping buried under buildings shall be in containment piping;
   1. Containment Conduit for gas pipe: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
   2. Containment Conduit for gas vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at regulator shall be one of the following:

   1. One-piece, bronze ball valve with bronze trim.
   2. Two-piece, full-port, bronze ball valves with bronze trim.
   3. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 and larger at service regulator shall be one of the following:

   1. Two-piece, full-port, bronze ball valves with bronze trim.
   2. Bronze plug valve.
   3. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

   1. One-piece, bronze ball valve with bronze trim.
   2. Two-piece, full-port, bronze ball valves with bronze trim.
   3. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:

   1. Two-piece, full-port, bronze ball valves with bronze trim.
   2. Bronze plug valve.
   3. Cast-iron, nonlubricated plug valve.

E. Valves in branch piping for single appliance shall be one of the following:

   1. One-piece, bronze ball valve with bronze trim.
   2. Two-piece, full-port, bronze ball valves with bronze trim.

3. Bronze plug valve.

3.15 UNDERGROUND GAS PIPING

A. The contractor shall field verify the exact size, location, depth and invert of all existing utilities within the limits of work prior to commencing his operations, and report any discrepancies to the engineer for resolution.

B. The contractor shall notify all utility companies 72 hours prior to the start of his operations and shall comply with the latest industrial code rule 53 regulations.

C. Install all high pressure and low piping in accordance with Con Edison requirements. Provide minimum cover over the top of the service pipe of 24” in accordance with con Edison requirements. Use only Con Ed approved back fill material, yellow sand, clean of all stones and debris.

D. Plastic and steel pipe shall be installed to allow thermal expansion and contraction. Joints shall be made under con Edison guidelines. Install tracer wire along the lengths of the pipe in accordance with con Edison guidelines. Plastic and steel pipe installation is subject to inspection by the utility.

E. All buried piping shall have plastic warning tape installed 1’-0” above the pipe as per utility requirements

F. All buried plastic pipe shall be installed with a #14 gage, red, insulated tracer wire from 1’ above grade, taped to the meter riser, and along the entire continuous length of the servie pipe to a point 1’ beyond the installation. The tracer with must not be electrically connected to any metallic pipe.

G. Provide all pressure tests in accordance with con Edison requirements and nfpa 54. The contractor is responsible for all required paperwork and filing.

H. Provide appropriate plugs and caps on open ended pipes.

I. When steel service pipe is required, the service pipe will be installed as follows:
   1. Buried steel service pipe is to be joined with non-insulating compression-type couplings or by welding. Buried threaded joints or flanged joints are not permitted.
   2. Compression couplings may be used to join exposed meter piping as depicted on gas meter piping drawings. Refer to applicable drawings in reference section. All meter piping must be properly supported and a-fixed to building wall, floor or ceiling.
   3. Care should be taken in the use and application of pipe joint compound or teflon™ tape. The compound shall only be applied to the male threaded end of the fitting. Teflon™ tape may not be used on pipe joints on the inlet side of a gas rotary meter.
   4. Lamp wick or cloth thread intended for the use as a seal in the root of threaded joints is not permitted.
   5. Changes in the direction of gas service pipe may be made through the use of factory bends only.

J. This project shall use HDPE pipe for underground service to the building. All above ground piping shall be steel as per the above specifications.

3.16 BELOW GROUND PIPING: LEAKAGE TESTING:

A. All of the customer's service piping and meter piping shall be tested in accordance with the following requirements:

B. All buried piping, before the building wall, shall be pressure tested per the requirement of Gas Specification G-8204, "Pressure testing Requirements for Gas Mains and Services".

C. All buried piping shall be blocked, supported and held in place with sandbags for the leakage test and coating inspection.

D. The test medium shall be either air, inert gas for testing pressures up to 150 psig. Water may be used for test pressures exceeding 150 psig.

E. The pressure source shall be isolated from the piping prior to the start of the test.

F. All joints, fittings, valves or other potential leak sources shall be checked for leakage during the pressure test using leak detection solution (soap water).

G. Test duration times are to be measured after the test medium has stabilized.

H. Pressure readings shall be performed using a calibrated pressure gauge.

I. Prior to tie-in, Con Edison will pressure test buried pipe to the head of service/riser valve

3.17 REQUIREMENTS FOR BUILDINGS IN FLOOD ZONES:

A. For buildings in flood zones with industrial meter sets or elevated pressure gas regulators, vent lines should be elevated so the terminus is 3' above the FEMA base flood elevation (BFE). If this is not feasible, a Vent Line Protector (VLP) shall be installed on the vent line to prevent water intrusion.

B. Refer to Gas Specification G-8217, "Flood-Prone Areas for the Installation of Gas Service Regulator Vent Line Protectors (VLP's)" for location listings (by M&S Plate) where water intrusion protection devices shall be installed on vent lines of elevated pressure gas services in Category 3 hurricane flood prone areas.

C. For those areas not listed in Gas Specification G-8217 where there is a potential for exposure to severe water or flooding, a water intrusion protection device should be considered for installation to prevent blocking of the service regulator vent line at Con Edison's discretion.

D. All outside regulators and the outside terminus for inside service regulators shall have an approved vent line cap (peck vent) or water intrusion protection device aka vent line protector (VLP).

E. Each Water Intrusion Protection Device shall:

1. Terminate outdoors with VLP facing downward.
2. Be weather and insect resistant.
3. Not be covered or obstructed in any way that would prevent or interfere with the operation of the gas regulator.

4. Have a minimum clearance of eighteen inches (18") from the final outdoor grade to the lower end of the protection device.

F. Refer to Gas Specification G-699, "Installation and Inspection of Gas Service Regulator Vent Line Protectors (VLPs)" for proper sizing of device and properly matched 90 deg. elbow and pipe strap.

3.18 PROHIBITED LOCATIONS FOR SERVICE AND METERING EQUIPMENT OUTDOORS AND INDOORS:

1. Service head valves, meters, pressure regulators, and associated equipment shall not be located:

2. In a designated Boiler or Fire Pump room of a multi-family or commercial building.
3. Gas meters may be not be installed within three feet (3 ft.) of sources of ignition including burners, electric panel boxes or machinery.
4. Where they could become a hindrance, obstruction or exposed to mechanical damage.
5. In sleeping quarters, toilets, bathrooms, washrooms, unventilated closets, stairways and stair landings.
6. Indoors on walls of elevator or dumbwaiter shafts, over doorways.
7. Under water pipes or other pipes which may be subject to sweating.
8. In any recess or enclosure unless its design and location have been approved by Con Edison.
9. Gas piping shall not be installed within six inches of electric meter equipment.

3.19 SPECIAL CONSIDERATIONS FOR SCHOOLS:

A. All gas piping and appliances shall be provided in accordance with New York State Education Department Manual of Planning Standards. Pipe materials, testing requirements and pressure limitation as stated in the SED Manual of Planning Standards shall supersede any other requirements of local utility or state or local codes. Including but not limited to the following.

B. GAS FACILITIES

1. See S409; Part IV, Site and Utilities.

2. Outside shut-off valves to shut off the supply of gas shall be installed and located for ready accessibility in case of emergency.

3. All gas equipment shall comply with AGA Listing or Approved Requirements and shall bear the listing or approval seal of a recognized testing agency such as the American Gas Association Laboratories, Inc. or Underwriter's Laboratories, Inc. Installation of gas equipment and piping shall be in accord with the applicable American National Standards Institute (ANSI) Code and the rules and regulations of the local gas utility.

   All gas appliances shall be provided with suitable pressure regulation by approved individual regulator. It is not required that individual Bunsen burner outlets be provided with pressure regulators.

4. Gas piping shall not be buried in slabs or under buildings unless there is no other reasonable location available. In such cases the gas pipe shall be encased in a gas tight casing which shall be vented to the atmosphere. Gas pipes shall not be run in or through heating ducts and shall not be installed in plenums where air is being returned to air handling systems for

recirculation. Gas piping shall be in accordance with ANSI Z21.30 or Z83.1 (where applicable) and in accordance with the Public Service Commission Regulations NYCRR, Part 255 and the Federal Department of Transportation, Part 192.

5. Gas Piping Tests

   a. Gas piping with a working pressure up to 12" W.C. must be welded for pipe sizes 3" and over. The completed line is to be pressure tested with air or inert gas for a minimum of one hour at 15 psig.

   b. Gas piping with a working pressure above 12" W.C. must be welded for pipe sizes 3" and over. The completed line is to be pressure tested with air or inert gas for a minimum of one hour at 1/2 times the working pressure or a minimum of 50 psig.

   c. Coated or wrapped pipe must be tested at 100 psig for a time period of 1 hour to insure the gas tightness of the pipe.

   d. The source of test pressure shall be isolated before the pressure tests are made. Tests shall be made in the presence of the architect, engineer, or their representative in conjunction with the local gas utility requirements.

6. Utility gas admitted into school buildings shall also be adequately odorized to render it detectable as prescribed by the Public Service Commission. Liquefied petroleum gases shall be odorized as prescribed by NFPA Standard No. 58.

7. Whenever liquefied petroleum is used, special pipe joint compound resistant to liquefied petroleum gas shall be used.

8. Gas piping entering a building shall be sleeved and sealed as stated in S403d.

C. BUILDING GAS PRESSURES

1. The allowable gas pressures within areas of the school building, other than the Boiler Room, (after the meter and/or regulators) will be the normal 1/2 psig or less service.

2. The allowable gas pressures within the Boiler Room, after the meter and/or regulators, may be up to 2 psig. Normally above 1/2 psig is only required for use in the Boiler Room. It will not be ordinary that gas pressure above 2 psig will be required and requests for utilization of gas pressures above 2 psig pressures will only be considered for approval upon formal presentation for such a request by the consulting engineer of technical reasons to the Office of Facilities Planning.

3. Pressure switches, pressure regulators, and other equipment requiring atmospheric pressure to balance a diaphragm shall be suitably vented to function properly. Over pressure relief valves, normally open vent solenoids, and other similar equipment shall be suitably vented to function properly and operate safely.

4. Gas pressure regulators designed and equipped with vent limiting devices need not be vented to the outdoors. Other gas pressure regulators shall be vented directly to the outdoors.

5. Relief valves and normally open vent valves shall be vented directly to the outdoors.

6. Vent line size

7. Vent lines for gas pressure regulators and other devices requiring venting which do not normally discharge gas through the vent shall be vented to the outdoors through a rigid pipe at least 3/4" in size. Consideration shall be given to increasing the size of the vent lines longer than 20 feet. Manifolding of these vents is allowed providing the cross-sectional area of a common vent line is equal to the sum of the cross-sectional areas of the manifolded vent lines.

8. Vent lines for relief valves and normally open vent valves shall be piped directly to the outdoors. (They shall not be vented commonly with devices requiring atmospheric air pressure to balance a diaphragm.) The size of these lines shall be calculated to provide full relief capacity under the conditions of design. The size of such lines shall never be less than the size of the connection at the device. Manifolding of these vent lines is allowed providing the cross-sectional area of a common vent line is not less than the cross-sectional area of the largest individual line plus 50% of the total cross-sectional area of all other connecting lines.

9. Vent termination - All vent lines shall terminate outdoors in a safe place and not less than 18" from any opening or overhang. Adequate means shall be employed to prevent water from entering the vent pipe, and also to prevent stoppage of it by insects or foreign matter.

D. AREAS OF USE OF GAS DISTRIBUTION

1. Science classrooms - gas outlets at fixed spacing (usually 5 feet) at work counters.

2. Homemaking classrooms - outlets to gas burner type kitchen equipment.

3. Art classrooms - gas outlets at work counters (usually every 30 inches).

4. Gas fired kilns - whenever used, a control valve shall be provided.

5. Kitchens - as required by equipment.

6. Soldering and Annealing - with compressed air if a compressed air torch is to be used.

7. A master control valve shall be provided for the instructor's control in any space having 3 or more gas outlets. This valve may be either a manual or an electrically operated solenoid valve.

8. If gas outlets are in close proximity to water or air outlets, the gas supply pipe shall be equipped with a gas check valve.

END OF SECTION

SECTION 22 1116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings
2. Ductile iron pipe and fittings
3. Pipe joining materials
4. Specialty valves
5. Transition fittings
6. Dielectric fittings.

B. Related Section:

1. Division 22 Section "Facility Water Distribution Piping" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.3 SUBMITTALS

A. Product Data: For the following products:

1. Specialty valves.
2. Transition fittings.
3. Dielectric fittings.
4. Flexible connectors.

B. Water Samples: Specified in "Cleaning" Article.

C. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Fire-suppression-water piping.
2. Domestic water piping, storm water piping and sanitary piping.
3. HVAC hydronic piping and Ductwork.
4. Electrical conduits.

D. Field quality-control reports.

E. Sustainable Design Submittals:
1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61 for potable domestic water piping and components.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Construction Manager, Owner no fewer than two days in advance of proposed interruption of water service.
2. Do not proceed with interruption of water service without Construction Manager's, 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.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

C. Comply with NSF Standard 372 for low lead.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. 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.

C. Copper-Tube, Extruded-Tee Connections:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Elkhart Products Corporation.
   c. Mueller Industries, Inc.
   d. NIBCO INC.

2. Description: Tee formed in copper tube according to ASTM F 2014.

2.3 DUCTILE-IRON SERVICE PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:
1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:
1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:
1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Plain-End, Ductile-Iron Pipe: AWWA C151/A21.51.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; 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. 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.

2.5 SPECIALTY VALVES

A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.6 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.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
d. Zurn Plumbing Products Group; Wilkins Water Control Products.

2. Description:

a. Pressure Rating: 150 psig at 180 deg F.
b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. EPCO Sales, Inc.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Factory-fabricated, bolted, companion-flange assembly.
b. Pressure Rating: 150 psig.

c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig.
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Calpico, Inc.
b. Lochinvar Corporation.

2. Description:

a. Galvanized-steel coupling.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Female threaded.
d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:
1. Standard: IAPMO PS 66.
2. Electroplated steel nipple complying with ASTM F1545.
3. Pressure Rating and Temperature: 300 psig at 225 deg F.
4. End Connections: Male threaded or grooved.
5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction

loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. 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 in Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install domestic water piping level without pitch and plumb.

G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that spac

H. 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.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

J. Install piping adjacent to equipment and specialties to allow service and maintenance.

K. Install piping to permit valve servicing.

L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

P. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."

Q. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."

R. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

S. 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."

T. 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."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.2 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. 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.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: 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."

F. Copper-Tubing Grooved Joints: Roll groove end of tube. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for roll-grooved joints.

G. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. 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

H. 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.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

3.4 DIELECTRIC FITTING INSTALLATION

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2and Smaller: Use dielectric couplings or 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 in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. 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.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.

3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

F. Install supports for vertical copper tubing every 10 feet

G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow 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 Booster Pumps: Cold-water 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. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.7 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports. Submit for engineer's review and approval.

3.9 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. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be one of the following:
1. Soft copper tube, ASTM B 88, Type K, ASTM B 88 Type L; wrought-copper, solder-joint fittings; and brazed, copper pressure-seal fittings; and pressure-sealed joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger, shall be one of the following:
1. Soft copper tube, ASTM B 88, Type K, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
2. Mechanical-joint, ductile-iron pipe; standard-pattern, mechanical-joint fittings; and mechanical joints.

F. Under-building-slab, combined domestic water, building-service, and fire-service-main piping, NPS 6 to NPS 12, shall be the following:
1. Mechanical-joint, ductile-iron pipe; standard-pattern, mechanical-joint fittings; and mechanical joints.

2. Push-on-joint, ductile-iron pipe; standard-pattern, push-on-joint fittings; and gasketed joints.

G. Under-building-slab, domestic water distribution piping, NPS 3 and smaller, shall be the following:
1. Hard copper pipe type L, ASTM B42 or soft copper tube type L, ASTM B 88. wrought-copper, solder-joint fittings; and brazed joints.

H. Aboveground domestic water distribution piping, NPS 2 and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; copper, solder-joint fittings; and joints.

I. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed soldered joints.

J. Aboveground domestic water piping, NPS 5 to NPS 8, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed soldered joints.
2. Hard copper tube, ASTM B 88, Type L or; grooved-joint, copper-tube appurtenances; and grooved joints.

K. Aboveground, combined domestic water-service and fire-service-main piping, NPS 6 to NPS 12, shall be one of the following:
1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

3.12 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION

SECTION 22 1119

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves
4. Balancing valves.
5. Temperature-actuated water mixing valves.
6. Strainers.
7. Outlet boxes
8. Hose bibbs.
9. Wall hydrants.
10. Drain valves.
11. Water hammer arresters.
12. Air vents.
13. Trap-seal primer valves.
14. Trap seal primer systems
15. Flexible connections

B. Related Sections include the following:

1. Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Division 22 Section "Domestic Water Piping".

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. FEBCO
b. Zurn Industries, LLC
c. Watts
d. Ames Co.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. FEBCO
b. Zurn Industries, LLC
c. Watts

d. Ames Co.

2.
3. Standard: ASSE 1011.
4. Body: Bronze, nonremovable, with manual drain.
5. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
6. Finish: Chrome or nickel plated.

C. Laboratory-Faucet Vacuum Breakers:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. FEBCO
b. Zurn Industries, LLC
c. Watts
d. Ames Co.

2.
3. Standard: ASSE 1035.
4. Size: NPS 1/4 or NPS 3/8 matching faucet size.
5. Body: Bronze.
6. End Connections: Threaded.
7. Finish: Chrome plated.

2.4 BACKFLOW PREVENTERS

A. Double-Detector Check Backflow-Prevention Assemblies:

1. Ames Co. or a comparable product by one of the following as indicated on Drawings:

a. FEBCO; SPX Valves & Controls.
b. Zurn Plumbing Products Group; Wilkins Div.
c. Watts Industries

2. Standard: ASSE 1015.
3. Operation: Continuous-pressure applications, unless otherwise indicated.
4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Size, Design Flow Rate: as indicated on drawings.
6. Body: stainless steel.
7. End Connections: Flanged.
8. Configuration: Designed for horizontal, straight through flow.
9. Accessories:

a. Valves: Outside screw and yoke gate-type with flanged ends on inlet and outlet.

B. Reduced-Pressure-Principle Backflow Preventers:

1. Ames Co. model as indicated on Drawings, or a comparable product by one of the following as indicated on Drawings:

a. Watts Industries.

b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
5. Body: Bronze for NPS 2 and smaller.
6. End Connections: Threaded for NPS 2 and smaller.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories:

a. Valves: Ball type with threaded ends on inlet and outlet ofNPS 2 and smaller.
b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Beverage-Dispensing-Equipment Backflow Preventers:
1. Ames Co. or a comparable product by one of the following as indicated on Drawings:

a. FEBCO; SPX Valves & Controls.
b. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1022.
3. Operation: Continuous-pressure applications.
4. Size: NPS 1/4 or NPS 3/8
5. Body: Stainless steel.
6. End Connections: Threaded.

D. Dual-Check-Valve Backflow Preventers:
1. Ames Co. or a comparable product by one of the following as indicated on Drawings:

a. FEBCO; SPX Valves & Controls.
b. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1024.
3. Operation: Continuous-pressure applications.
4. Size: [NPS 1/2] [NPS 3/4] [NPS 1] [NPS 1-1/4].
5. Body: Bronze with union inlet.

E. Carbonated-Beverage-Dispenser, Dual-Check-Valve Backflow Preventers:
1. Ames Co. or a comparable product by one of the following as indicated on Drawings:

a. FEBCO; SPX Valves & Controls.
b. Zurn Plumbing Products Group; Wilkins Div.

2.
3. Standard: ASSE 1032.
4. Operation: Continuous-pressure applications.
5. Size: NPS 1/4 or NPS 3/8 (DN 8 or DN 10).
6. Body: Stainless steel.
7. End Connections: Threaded.

F. Backflow-Preventer Test Kits:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. FEBCO; SPX Valves & Controls.
   b. Watts Industries, Inc.; Water Products Div.
   c. Zurn Plumbing Products Group; Wilkins Div.

2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. zurn
   b. Watts
   c. Josam.
2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Body: Bronze with chrome-plated finish for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
5. Valves for Booster Heater Water Supply: Include integral bypass.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

B. Water-Control Valves:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. FEBCO
   b. Zurn Industries, LLC
   c. Watts
   d. Ames Co.
2. Description: Pilot-operated, diaphragm-type, single-seated, main water-control valve.
3. Pressure Rating: Initial working pressure of 150 psig minimum with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.
4. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.

   a. Pattern: Angle or Globe-valve design.
   b. Trim: Stainless steel.

5. Design Flow: as per plan

6. Design Inlet Pressure: as per plan
7. Design Outlet Pressure Setting: as per plan
8. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

2.6 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Conbraco Industries, Inc.
    b. Crane Co.; Crane Valve Group
    c. Milwaukee Valve Company.
    d. NIBCO INC.

2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.7 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Individual-Fixture, Water Tempering Valves:

1. Lawler Company Model 911, or a comparable product by one of the following:

    a. Armstrong International, Inc.
    b. Leonard Valve Company.
    c. Powers; a Watts Industries Co.
    d. Symmons Industries, Inc.

2. Standard: ASSE 1016, thermostatically controlled water tempering valve.
3. Pressure Rating: 125 psigminimum, unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 80˚F

B. Primary Thermostatic, Water Mixing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Holby Valve Co., Inc.
    b. Lawler Manufacturing Company, Inc.
    c. Leonard Valve Company.
    d. Powers; a Watts Industries Co.
    e. Symmons Industries, Inc.

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Exposed-mounting, thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Pressure Rating: 125 psig minimum, unless otherwise indicated.
9. Tempered-Water Setting: 120˚F
10. Valve Finish: Rough bronze.
11. Piping Finish: Copper

C. Manifold, Thermostatic, Water Mixing-Valve 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:

    a. Holby Valve Co., Inc.
    b. Lawler Manufacturing Company, Inc.
    c. Leonard Valve Company.
    d. Powers; a Watts Industries Co.
    e. Symmons Industries, Inc.

2. Description: Factory-fabricated, cabinet-type, thermostatically controlled, water mixing-valve assembly in two or three-valve parallel arrangement.
3. Large-Flow Parallel: Thermostatic, water mixing valve and downstream-pressure regulator with pressure gages on inlet and outlet.
4. Intermediate-Flow Parallel: Thermostatic, water mixing valve and downstream-pressure regulator with pressure gages on inlet and outlet.
5. Small-Flow Parallel: Thermostatic, water mixing valve.
6. Thermostatic Mixing Valves: Comply with ASSE 1017. Include check stops on hot- and cold-water inlets and shutoff valve on outlet.
7. Water Regulator(s): Comply with ASSE 1003. Include pressure gage on inlet and outlet.
8. Pressure Rating: 125 psig minimum unless otherwise indicated.
9. Cabinet: Factory fabricated, stainless steel, for recessed mounting and with hinged, stainless-steel door.
10. Selected Large-Flow, Tempered-Water Valve Size: .
11. Tempered-Water Setting: .
12. Unit Tempered-Water Design Flow Rate: .
13. Unit Minimum Tempered-Water Design Flow Rate: .
14. Selected Unit Flow Rate at 45-psig Pressure Drop: .

15. Unit Pressure Drop at Design Flow Rate: .
16. Unit Tempered-Water Outlet Size: end connection.
17. Unit Hot- and Cold-Water Inlet Size: end connections.
18. Thermostatic Mixing Valve and Water Regulator Finish: Polished, chrome plated.
19. Piping Finish: Chrome plated.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller;flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

    a. Strainers NPS 2 and Smaller: 0.033 inch.
    b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.9 WASHING MACHINE OUTLET BOXES (not used)

A. Clothes Washer Outlet Boxes:
1. Mounting: Recessed.
2. Material and Finish: Enameled-steel or epoxy-painted-steel or box and faceplate.
3. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
4. Supply Shutoff Fittings: NPS 1/2 gate, globe, or ball valves and NPS 1/2 copper, water tubing.
5. Drain: NPS NPS 2 standpipe and P-trap for direct waste connection to drainage piping.
6. Inlet Hoses: Two 60-inch-long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
7. Drain Hose: One 48-inch-long, rubber household clothes washer drain hose with hooked end.

B. Icemaker Outlet Boxes:
1. Mounting: Recessed.
2. Material and Finish: Enameled-steel or epoxy-painted-steel or Stainless-steel box and faceplate.
3. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
4. Supply Shutoff Fitting: NPS 1/2 gate, globe, or ball valve and NPS 1/2 copper, water tubing.

2.10 HOSE BIBBS

A. Interior Mechanical Room Application:

1. Available Manufacturers:
   a. Watts.
   b. Nibco.
   c. Chicago.

2. Standard: ASME A112.18.1 for sediment faucets.
3. Body Material: Bronze.
4. Seat: Bronze, replaceable.
5. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
7. Pressure Rating: 125 psig.
8. Vacuum Breaker: Integral, drainable, hose-connection vacuum breaker complying with ASSE 1011.
9. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
10. Operation for Equipment Rooms: Wheel handle or operating key.
11. Include operating key with each operating-key hose bibb.

B. Interior Toilet Room Application:

1. Available Manufacturers:

   a. Woodford Manufacturing.
   b. Chicago Faucet.

2. Body: Bronze or brass with integral mounting flange.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish: chrome or nickel plated.
9. Operation: Wheel handle or operating key.
10. Include operating key with each operating-key hose bibb.

2.11 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:
1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze or Chrome plated.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.

10. Nozzle and Wall-Plate Finish: Polished nickel bronze in public area, Rough bronze in utility rooms.
11. Operating Keys(s): One with each wall hydrant.

B. Nonfreeze, Hot- and Cold-Water Wall Hydrants:
1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rods: Of length required to match wall thickness. Include wall clamps.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze in exposed public area, or Chrome plated.
9. Vacuum Breaker:

a. Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
b. Garden-hose thread complying with ASME B1.20.7 on outlet.

10. Operating Key(s): One with each wall hydrant.

C. Vacuum Breaker Wall Hydrants:

1.
2. Standard: ASSE 1019, Type A or Type B.
3. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
4. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
5. Pressure Rating: 125 psig.
6. Operation: Loose key or wheel handle.
7. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
8. Inlet: NPS 1/2 or NPS 3/4.
9. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.12 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.

B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

D. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.13 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Available Manufacturers:
   a. AMTROL, Inc.
   b. Josam Company.
   c. PPP Inc.
   d. Watts Drainage Products Inc.
   e. Zurn Plumbing Products Group; Specification Drainage Operation.
   f. Jay R. Smith.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Stainless steel construction with metal bellows, precharged.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.14 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 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents:

1. Body: Stainless steel.
2. Pressure Rating: 150-psig minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.15 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. PPP Inc Model P-2 with Distribution Unit DU-2 or a comparable product by one of the following:

a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
b. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.16 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems:
1. Standard: ASSE 1044.
2. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.
3. Cabinet: Recessed-mounted steel box with stainless-steel cover.
4. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.

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.

5. Vacuum Breaker: ASSE 1001.
6. Number Outlets: Four.
7. Size Outlets: NPS 1/2.

2.17 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flex Pression Ltd.
2. Flex-Hose Co., Inc.
3. Metraflex Company (The).
4. Universal Metal Hose.

B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

PART 3 - EXCUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install balancing valves in locations where they can easily be adjusted.

C. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.

D. Install Y-pattern strainers for water on supply side of each control valve, solenoid valve, and pump, and where indicated on Drawings.

E. Install water hammer arresters in water piping according to PDI-WH 201.

F. Install air vents at high points of water piping.

G. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

H. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe

diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air brakes are not acceptable for this application.

3. Do not install bypass piping around backflow preventers.

I. All valves, fittings and specialties shall have a pressure class rating that exceeds the pressure of the system it is installed in.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Pressure vacuum breakers.
2. Intermediate atmospheric-vent backflow preventers.
3. Reduced-pressure-principle backflow preventers.
4. Double-check, backflow-prevention assemblies.
5. Carbonated-beverage-machine backflow preventers.
6. Dual-check-valve backflow preventers.
7. Reduced-pressure-detector, fire-protection, backflow-preventer assemblies.
8. Double-check, detector-assembly backflow preventers.
9. Water pressure-reducing valves.
10. Calibrated balancing valves.
11. Primary, thermostatic, water mixing valves.
12. Manifold, thermostatic, water mixing-valve assemblies.
13. Photographic-process, thermostatic, water mixing-valve assemblies.
14. Primary water tempering valves.
15. Outlet boxes.
16. Hose stations.
17. Supply-type, trap-seal primer valves.
18. Trap-seal primer systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer double-check, backflow-prevention assembly and double-check, detector-assembly backflow preventer backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION

SECTION 22 1316

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 Requirements:

1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.
2. Section 221329 "Sanitary Sewerage Pumps" for effluent and sewage pumps.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control reports.

C. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.

2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.5 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 Construction Manager, 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 Construction Manager's, Owner's written permission.

PART 2 - PRODUCTS

2.1 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: 300-foot head of water
2. Waste, Force-Main Piping: 100 psig.

2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. 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.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ANACO-Husky.
b. Dallas Specialty & Mfg. Co.
c. MIFAB, Inc.
d. 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ANACO-Husky.
b. Dallas Specialty & Mfg. Co.
c. MIFAB, Inc.
d. 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ANACO-Husky.
b. Dallas Specialty & Mfg. Co.
c. MIFAB, Inc.
d. Tyler Pipe.

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.

F. No Hub Fitting Restraints:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Holdrite:117 Series No Hub Fitting Restraints or comparable

2. Description: CISPI Designation 301-12, large diameter no-hub cast iron fittings, 4” and over in size, shall be provided with supplemental support to minimize the risk of joints separation under high thrust conditions. Auxiliary restraint products used shall be manufactured assemblies with thrust pressure rating adequate for the specific installation. Field devised methods and materials shall not be used to accomplish this application solution.

2.4 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

A. Pipe: ASTM A 746, 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.

2.5 DUCTILE-IRON, PRESSURE PIPE AND FITTINGS

A. 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

2.6 PRESSURE-TYPE PIPE COUPLINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cascade Waterworks Mfg. Co.
2. Dresser, Inc.
3. Jay R. Smith Mfg. Co.
4. JCM Industries, Inc.
5. Victaulic Company.

B. Tubular-Sleeve Couplings: AWWA C219, with center sleeve, gaskets, end rings, and bolt fasteners.

C. Metal, bolted, sleeve-type, reducing or transition coupling; for joining underground pressure piping. Include 200-psig minimum pressure rating and ends of same sizes as piping to be joined.

D. Center-Sleeve Material: Stainless steel or Ductile iron.

E. Gasket Material: Natural or synthetic rubber.

F. Metal Component Finish: Corrosion-resistant coating or material

2.7 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.

2.8 SPECIALTY PIPE FITTINGS

A. Non-pressure 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:

    a. Standard: ASTM C 1173.
    b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    c. Sleeve Materials:
        1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
        2) For Concrete Pipes: ASTM C 443, rubber.
        3) For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
        4) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
        5) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

    a. Standard: ASTM C 1460.
    b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Ring-Type, Flexible Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Fernco Inc.
    b. Logan Clay Pipe.
    c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

C. 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:

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) Capitol Manufacturing Company.
2) Hart Industries International, Inc.
3) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
4) 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.

3. Dielectric Nipples:

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) Grinnell Mechanical Products.
2) Precision Plumbing Products, Inc.
3) Victaulic Company.

b. Description:

1) Electroplated steel nipple complying with ASTM F 1545.
2) Pressure Rating: 300 psig at 225 deg F.
3) End Connections: Male threaded or grooved.
4) Lining: Inert and noncorrosive, propylene.

2.9 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105/A 21.5.

B. Material: high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

2.10 EXPANSION JOINTS AND DEFLECTION FITTINGS

A. Ductile-Iron, Flexible Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. EBAA Iron, Inc.
b. Romac Industries, Inc.

c. Star Pipe Products.

2. Description: Compound 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, rated for 250-psig minimum working pressure and for offset and expansion indicated.

B. Ductile-Iron Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dresser, Inc.
b. EBAA Iron, Inc.
c. JCM Industries, Inc.
d. Smith-Blair, Inc.; a Sensus company.

2. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. 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-psigminimum working pressure and for up to 15 degrees of deflection.

2.11 BACKWATER VALVES

A. Cast-Iron Backwater Valves:

1. Description: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company.
c. Watts; a Watts Water Technologies company.
d. Zurn Industries, LLC.

3. Horizontal type; with swing check valve and hub-and-spigot ends.
4. Combination horizontal and manual gate-valve type; with swing check valve, integral gate valve, and hub-and-spigot ends.
5. Terminal type; with bronze seat, swing check valve, and hub inlet.

2.12 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Josam Company.
    b. Smith, Jay R. Mfg. Co.
    c. Watts Water Technologies, Inc.
    d. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

2. 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.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

PART 3 - EXECUTION

3.1 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, 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. 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.

K. Lay buried building waste piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. 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."

N. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

O. Install engineered soil and waste and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.

3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

P. Install underground, ductile-iron, force-main piping according to AWWA C600.

1. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints.
2. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
3. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

Q. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."

1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

R. Install force mains at elevations indicated

S. Plumbing Specialties:

1. 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."
2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Sanitary Waste Piping Specialties."

3. Install backwater valves in sanitary waster gravity-flow piping.

    a. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."

T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

U. 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."

V. 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."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.2 PIPE JOINT CONSTRUCTION

A. 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.

B. 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.

C. 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.

D. 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.

E. 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.

F. 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 flexiblecouplings for pipes of same or slightly different OD.

b. Unshielded, increaser/reducer-pattern, flexiblecouplings for pipes with different OD.
c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure pipe couplings for force-main joints.

G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105/A21.5:
1. Hubless cast-iron soil pipe and fittings.
2. Ductile-iron pipe and fittings.
3. Expansion joints and deflection fittings.

H. Install No Hub Fitting Restraints on all piping 4 inch and over in size, shall be provided with supplemental support to minimize the risk of joints separation under high thrust conditions. Auxiliary restraint products used shall be manufactured assemblies with thrust pressure rating adequate for the specific installation. Field devised methods and materials shall not be used to accomplish this application solution

3.3 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 Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads. H-50

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches Insert dimensions deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

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, non-pressure 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 nipples.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

A. Comply with requirements in Section 220523. General-duty valve installation requirements.

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.
4. Comply with requirements for backwater valve specified in Section 221319 "Sanitary Waste Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

A. 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 carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
4. Vertical Piping: MSS Type 8 or Type 42, clamps.
5. 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.

6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
7. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

C. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

D. 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.

E. Install supports for vertical cast-iron soil piping every 15 feet and or at every floor

F. 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.
7. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
8. NPS 6 and NPS 8: 12 feet with 3/4-inch rod.
9. NPS 10 and NPS 12: 12 feet with 7/8-inchrod

G. 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

H. Install supports for vertical copper tubing every 10 feet and at every floor

3.7 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 waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste 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 waste 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. Comply with requirements for backwater valves cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
6. Equipment: Connect waste piping as indicated.

    a. Provide shutoff valve if indicated and union for each connection.
    b. 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:

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.

3.8 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."

3.9 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.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.

    a. Isolate test source and allow to stand for four hours.
    b. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.10 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.

3.11 PIPING SCHEDULE

A. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy duty hubless-piping couplings; and coupled joints.
3. Copper DWV tube, copper drainage fittings, and soldered joints.

4. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

B. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.

a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2: Hard copper tube, Type M; copper pressure fittings; and soldered joints.

3. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

D. Aboveground, vent piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

E. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

1. Extra heavy class, cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

F. Underground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Extra heavy class, cast-iron soil piping; gaskets; and gasketed joints.
2. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

3. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints

G. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 shall be any of the following:

1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.

H. Aboveground sanitary-sewage force mains NPS 2-1/2 to NPS 6 shall be any of the following:

1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.

2. Galvanized-steel pipe, pressure fittings, and threaded joints.

I. Underground sanitary-sewage force mains NPS 4 and smaller shall be any of the following:
1. Ductile-iron, mechanical-joint piping and mechanical joints.
2. Fitting-type transition coupling for piping smaller than NPS 1-1/2 and pressure transition coupling for NPS 1-1/2 and larger if dissimilar pipe materials.

J. Underground sanitary-sewage force mains NPS 5 and larger shall be any of the following:
1. Ductile-iron, mechanical-joint piping and mechanical joints.
2. Pressure transition couplings if dissimilar pipe materials.

END OF SECTION

SECTION 22 1319

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:
1. Backwater valves
2. Cleanouts.
3. Air admittance Valves
4. Roof flashing assemblies.
5. Through-penetration firestop assemblies.
6. Miscellaneous sanitary drainage piping specialties.
7. Flashing Materials
8. Solids interceptors.

B. Related Sections include the following:

1. Division 22 Section "Sanitary Waste and Vent Piping".

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. HDPE: High-density polyethylene plastic.

C. PE: Polyethylene plastic.

D. PP: Polypropylene plastic.

E. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
1. Grease interceptors.

B. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 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.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing, and marked for intended location and application.

2.2 BACKWATER VALVES

A. Horizontal, Cast-Iron Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg. Co.
    b. Josam Company.
    c. MIFAB, Inc.
    d. Watts; a Watts Water Technologies company.
    e. Zurn Industries, LLC.

2. Standard: ASME A112.14.1.

3. Size: Same as connected piping.
4. Body: Cast iron.
5. Cover: Cast iron with bolted or threaded access check valve.
6. End Connections: Hubless.
7. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang open for airflow unless subject to backflow condition.
8. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

B. Drain-Outlet Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company.
c. Watts; a Watts Water Technologies company.
d. Zurn Industries, LLC.

2. Size: Same as floor drain outlet.

3. Body: Cast iron or bronze made for vertical installation in bottom outlet of floor drain.
4. Check Valve: Removable ball float.
5. Inlet: Threaded.
6. Outlet: Threaded or spigot.

2.3 CLEANOUTS

A. Cast Iron Exposed Cleanouts:

1. Available Manufacturers:

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.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Cast Iron Exposed Floor Cleanouts:

1. Available Manufacturers:

a. Josam Company; Josam Div.
b. Watts Drainage Products Inc.
c. Zurn Plumbing Products Group; Light Commercial Operation.
d. Wade
e. Jay R. Smith.

2. Standard: ASME A112.36.2M.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.

5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Threaded.
8. Closure: Brass plug with tapered threads.
9. Adjustable Housing Material: Cast iron.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Medium Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
14. Standard: ASME A112.3.1.
15. Size: Same as connected branch.
16. Housing: Stainless steel.
17. Closure: Stainless steel with seal.
18. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts:
1. Available Manufacturers:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Watts Drainage Products Inc.
d. Zurn Plumbing Products Group; Specification Drainage Operation.
e. Wade
f. Jay R. Smith

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch, or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: cast-iron plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.4 AIR-ADMITTANCE VALVES

A. Fixture Air-Admittance Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ayrlett, LLC.
b. Durgo, Inc.
c. Oatey.
d. ProSet Systems Inc.

2. Standard: ASSE 1051, Type A for single fixture or Type B for branch piping.

3. Housing: Plastic.

4. Operation: Mechanical sealing diaphragm.
5. Size: Same as connected fixture or branch vent piping.

B. Stack Air-Admittance Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ayrlett, LLC.
b. Durgo, Inc.
c. Oatey.
d. ProSet Systems Inc.

2. Standard: ASSE 1050 for vent stacks.
3. Housing: Plastic.
4. Operation: Mechanical sealing diaphragm.
5. Size: Same as connected stack vent or vent stack.

C. Wall Box for Air-Admittance Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ayrlett, LLC.
b. Durgo, Inc.
c. Oatey.
d. ProSet Systems Inc.

2. Description: White plastic housing with white plastic grille, made for recessed installation. Include bottom pipe connection and space to contain one air-admittance valve.
3. Size: About 9 inches wide by 8 inches high by 4 inches deep

2.5 FLOOR DRAINS

A. Cast-Iron Floor Drains:
1. Available manufacturers:
a. Josam Company; Josam Div.
b. Tyler Pipe; Wade Div.
c. Watts Drainage Products Inc.
d. Zurn Plumbing Products Group; Light Commercial Operation.
e. Jay R. Smith

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Anchor Flange: Required.
6. Clamping Device: Required.
7. Sediment Bucket: Not required for finished areas.
8. Top or Strainer Material: Nickel bronze.
9. Top Shape: Round.
10. Top Loading Classification: Light Duty.

11. Trap Material: Cast iron.
12. Trap Pattern: Standard P-trap.

2.6 ROOF FLASHING ASSEMBLIES (all architectural specifications shall supersede this paragraph).

A. Roof Flashing 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:

a. Acorn Engineering Company; Elmdor/Stoneman Div.
b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch-thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.7 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. 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.
5. 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.
6. Special Coating: Corrosion resistant on interior of fittings.

2.8 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564 rubber gaskets.
2. Size: Same as connected waste piping.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. NPS 2: 4-inch-minimum water seal.
    b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.

C. 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.

D. 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.

E. 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 2 inches 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.

F. Stack Flashing Fittings:

1. Description: Counter-flashing-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.

G. 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.

H. Frost-Resistant Vent Terminals:

1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.
2. Design: To provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

I. Expansion Joints:

1. Standard: ASME A112.6.4.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

2.9 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft. thickness.
2. Vent Pipe Flashing: 8 oz./sq. ft. thickness.

B. 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.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.10 SOLIDS INTERCEPTORS

A. Solids Interceptors:
1. Jay R. Smith Model 8710 or a comparable product by one of the following:

a. Josam Company; Josam Div.
b. Tyler Pipe; Wade Div.
c. Watts Drainage Products Inc.
d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Type: Factory-fabricated interceptor made for removing and retaining sediment from wastewater.
3. Body Material: Cast iron or steel.
4. Interior Separation Device: Screens.
5. Interior Lining: Corrosion-resistant enamel.
6. Mounting: Above floor.

2.11 CLAY INTERCEPTOR

A. Solids Interceptors:
1. Jay R. Smith Model 871 T0150 or a comparable product by one of the following:

a. Josam Company; Josam Div.
b. Tyler Pipe; Wade Div.
c. Watts Drainage Products Inc.
d. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Type: Factory-fabricated interceptor made for removing and retaining sediment from wastewater.
3. Body Material: ABS
4. Interior Separation Device: Screens.
5. 15 gpm
6. 1 ½" inlet / outlet
7. Quick removal latches for top access sediment strainer removal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backwater valves in building drain piping.

1. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

F. 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.

G. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

H. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

I. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

J. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

K. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

L. 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.

M. Install air-gap fittings on indirect-waste piping discharge into sanitary drainage system.

N. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

O. Install vent caps on each vent pipe passing through roof.

P. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

Q. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

R. Install wood-blocking reinforcement for wall-mounting-type specialties.

S. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

T. All valves, fittings and specialties shall have a pressure class rating that exceeds the pressure of the system it is installed in.

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.

C. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping.

D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

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.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Intercepters.

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.

1. Nameplates and signs are specified in Section 220553 "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

SECTION 22 1319.13

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. Cast iron floor drains.
2. Stainless steel floor drains
3. Cast iron floor sinks
4. Stainless steel floor sinks
5. Trench 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.

C. All sanitary floor drains shall be provided with pro-vent trap guard size for each floor drain. Product shall be tested in accordance with ASSE 1072 test standard for ANSI/ASME A112.6.3

D. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Jay R. Smith Mfg. Co.
   b. Josam Company.
   c. Watts; a Watts Water Technologies company.
   d. Zurn Industries, LLC.

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom or Side coordinate with filed conditions.
9. Backwater Valve: Not required unless indicated on drawings.
10. Coating on Interior and Exposed Exterior Surfaces: For laboratory applications Acid-resistant enamel.
11. Sediment Bucket:
12. Top or Strainer Material: Gray cast iron in mechanical equipment rooms, polished nickel bronze in all finished areas.
13. Top Shape: Round or Square as scheduled
14. Dimensions of Top or Strainer: Refer to schedule.
15. Top Loading Classification: Heavy Duty 20 for any application subject to traffic like parking or repair garages.
16. Funnel: Not required unless specified on plan or in schedule.
17. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
18. Trap Material: Cast iron.
19. Trap Pattern: Standard P-trap.
20. Trap Features: Cleanout, Trap-seal primer valve drain connection where indicated in schedule.

E. Stainless-Steel Floor Drains, ASME A112.3.1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Jay R. Smith Mfg. Co.
   b. Josam Company.
   c. Watts; a Watts Water Technologies company.
   d. Zurn Industries, LLC.

2. Outlet: Bottom or Side.

3. Top or Strainer Material: Stainless steel.
4. Top Shape: Round or Square.
5. Dimensions of Top or Strainer:
6. Seepage Flange: Required.

7. Anchor Flange: Required.
8. Clamping Device: Required.
9. Trap-Primer Connection: Required where indicated on plan
10. Trap Material: Stainless steel.
11. Trap Pattern: Standard P-trap.

2.2 FLOOR SINKS

A. Cast-Iron Floor Sinks:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2.
a. Jay R. Smith Mfg. Co.
b. Josam Company.
c. Watts; a Watts Water Technologies company.
d. Zurn Industries, LLC.

3. Standard: ASME A112.6.7.
4. Pattern: Funnel floor drain.
5. Body Material: Cast iron.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom, no-hub connection.
9. Coating on Interior Surfaces: Not required
10. Sediment Bucket: .
11. Internal Strainer: Flat.
12. Internal Strainer Material: Aluminum.
13. Top Grate Material: loose,r hinged.
14. Top of Body and Grate Finish: Nickel bronze.
15. Top Shape: Round or Square.
16. Dimensions of Top Grate: as per plan.
17. Top Loading Classification: .
18. Funnel: Required..

B. Stainless-Steel Floor Sinks, ASME A112.6.7:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2.
a. Jay R. Smith Mfg. Co.
b. Josam Company.
c. Watts; a Watts Water Technologies company.
d. Zurn Industries, LLC.

3. Standard: ASME A112.6.7.
4. Pattern: Funnel floor drain.
5. Body Material: Stainless steel.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom, no-hub connection.
9. Sediment Bucket: .

10. Internal Strainer: Dome or Flat.
11. Internal Strainer Material: Stainless steel.
12. Top Grate Material: loose or hinged.
13. Top of Body and Grate Finish: Satin nickel or Stainless steel.
14. Top Shape: Round or Square.
15. Dimensions of Top Grate: refer to plan and schedule.
16. Top Loading Classification: No traffic.
17. Funnel: Required..

2.3 TRENCH DRAINS

A. Trench Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg. Co.
    b. Josam Company.
    c. MIFAB, Inc.
    d. Tyler Pipe; a subsidiary of McWane Inc.
    e. Watts; a Watts Water Technologies company.
    f. Zurn Industries, LLC.

2. Standard: ASME A112.6.3 for trench drains.
3. Material: Ductile or gray iron.
4. Flange: Anchor and Seepage.
5. Clamping Device: Required.
6. Outlet: Bottom, End or Side coordinate with field conditions
7. Grate Material: Stainless steel.
8. Grate Finish: Brushed.
9. Dimensions of Frame and Grate: refer to plan and schedule
10. Top Loading Classification: Extra Heavy Duty. H-20
11. Trap Material: Cast iron.
12. Trap Pattern: Standard 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.

B. Install trench drains at low points of surface areas to be drained.

1. Set grates of drains flush with finished surface, unless otherwise indicated.

C. Comply with ASME A112.3.1 for installation of stainless-steel channel drainage systems.

1. Install on support devices, so that top will be flush with adjacent surface.

D. Install FRP channel drainage system components on support devices, so that top will be flush with adjacent surface.

E. Install plastic channel drainage system components on support devices, so that top will be flush with adjacent surface.

F. Install open drain fittings with top of hub 2 inches above floor.

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

SECTION 22 1413

STORM DRAINAGE 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. Hubless, cast-iron soil pipe and fittings.
2. Galvanized-steel pipe and fittings.
3. Ductile-iron pipe and fittings.
4. Specialty pipe and fittings.
5. Encasement for underground metal piping.

B. Related Sections:

1. Division 33 Section "Storm Utility Drainage Piping" for storm drainage piping outside the building.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For controlled-flow roof drainage system. Include calculations, plans, and details.

C. Field quality-control reports.

D. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping and "NSF-sewer" for plastic sewer piping.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Storm-Drainage 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 Construction Manager, Owner no fewer than two days in advance of proposed interruption of storm-drainage service.
2. Do not proceed with interruption of storm-drainage service without Construction Manager's, Owner's written permission.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 300-foot head of water
2. Storm Drainage, Force-Main Piping: 100 psig.

2.2 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.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standard: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Fernco Inc.
b. MIFAB, Inc.
c. 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.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Fernco
   b. ANACO-Husky.
   c. MIFAB, Inc.
   d. Tyler Pipe; a subsidiary of McWane Inc.

2. Standard: 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.

D. Cast-Iron, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. 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.

E. No Hub Fitting Restraints:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Holdrite: 117 Series No Hub Fitting Restraints or comparable
2. Description: CISPI Designation 301-12, large diameter no-hub cast iron fittings, 4” and over in size, shall be provided with supplemental support to minimize the risk of joints separation under high thrust conditions. Auxiliary restraint products used shall be manufactured assemblies with thrust pressure rating adequate for the specific installation. Field devised methods and materials shall not be used to accomplish this application solution.

2.4 GALVANIZED-STEEL PIPE AND FITTINGS

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. Tubular USA.
2. U.S. Steel.
3. Wheatland Tube Company.

B. Pipe: ASTM A 53/A 53M, Type E, Standard Weight class. Include square-cut-grooved or threaded ends matching joining method.

C. Galvanized-Cast-Iron Drainage Fittings: ASME B16.12, threaded.

D. 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.

E. 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 DUCTILE-IRON PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Ductile Iron Pipe.
2. McWane Ductile.
3. U.S. Pipe and Foundry Company.

B. Ductile-Iron, Mechanical-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs 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:

a. 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, LLC; a division of MCP Industries.
4) Plastic Oddities.

b. Standard: ASTM C 1173.

c. Description: Elastomeric sleeve, 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.

4. Shielded, Nonpressure Transition Couplings:

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) Cascade Waterworks Mfg. Co.
2) Mission Rubber Company, LLC; a division of MCP Industries.

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.
d. End Connections: Same size as and compatible with pipes to be joined.

5. Pressure Transition Couplings:

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) Cascade Waterworks Mfg. Co.
2) EBAA Iron, Inc.
3) Ford Meter Box Company, Inc. (The).
4) JCM Industries, Inc.
5) Romac Industries, Inc.

b. Standard: AWWA C219.

c. Description: Metal, sleeve-type couplings same size as pipes to be joined, and with pressure rating at least equal to and ends compatible with pipes to be joined.
d. Center-Sleeve Material: Carbon steel, Stainless steel, Ductile iron.
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:

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) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
4) Wilkins; a Zurn company.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 150 psig at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

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) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
4) Wilkins; a Zurn company.

b. 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.

4. Dielectric-Flange Insulating Kits:

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) 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.

5. Dielectric Nipples:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Grinnell Mechanical Products.
2) Matco-Norca.
3) Precision Plumbing Products.

b. Description: Electroplated steel nipple.

c. Standard: IAPMO PS 66.
d. Pressure Rating: 300at 225 deg F.
e. End Connections: Male threaded or grooved.
f. 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: High-density, cross-laminated polyethylene film of 0.004-inch or linear low-density polyethylene film of 0.008-inchminimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

PART 3 - EXECUTION

3.1 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, and other design considerations. Install piping as indicated unless deviations from 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 specifically indicated otherwise.

C. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. 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.

J. Lay buried building piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

K. Install storm drainage piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4and larger.
2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

L. Install cast-iron storm piping according to CISPI's "Cast Iron Storm Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron storm Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

M. Install engineered controlled-flow drain specialties and storm drainage piping in locations indicated.

N. Install steel piping according to applicable plumbing code.

O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

P. Install underground, ductile-iron, force-main piping according to AWWA C600.

1. Install buried piping inside building between wall and floor penetrations and connection to storm sewer piping outside building with restrained joints.
2. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
3. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

Q. Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."

1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

R. Install force mains at elevations indicated.

S. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Install cleanout fitting with closure

plug inside the building in storm drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 Section "Storm Drainage Piping Specialties."

2. Install drains in storm drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Storm Drainage Piping Specialties."

T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

U. 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."

V. 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."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Calked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints: Join 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. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fittings. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

F. 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.

G. Joint Restraints and Sway Bracing:

1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:

a. Provide axial restraint for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
b. Provide rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.
c. Provide rigid sway bracing for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction and branch openings.

H. All no-hub cast iron fittings, 4” and over in size, shall be provided with supplemental support to minimize the risk of joints separation under high thrust conditions. Auxiliary restraint products used shall be manufactured assemblies with thrust pressure rating adequate for the specific installation. Field devised methods and materials shall not be used to accomplish this application solution

3.3 SPECIALTY PIPE FITTING INSTALLATION

A. 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.

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 unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges, flange kits, nipples.
4. Dielectric Fittings for NPS 5and Larger: Use dielectric flange kits.

3.4 VALVE INSTALLATION

A. General valve installation requirements for general-duty valve installations are specified in the following Sections:

1. Section 220523 general duty valves for plumbing."

B. Shutoff Valves:

1. Install shutoff valve on each sump pump discharge.
2. Install full port ball valve for piping NS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2and larger.

C. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Install backwater valves in accessible locations.

3. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

3.5 HANGER AND SUPPORT INSTALLATION

A. 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 carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
4. Vertical Piping: MSS Type 8 or Type 42, clamps.
5. 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.

6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
7. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inchminimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet and at every floor

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
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.

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

I. 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 to 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.

J. Install supports for vertical copper tubing every 10 feet.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Comply with requirements for cleanouts specified in Division 22 Section "Storm Drainage Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

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.

F. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed storm drainage 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.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage 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 storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage 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 until completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.

    a. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

F. Piping will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

3.9 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping NPS 6 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; Heavy Duty, hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Copper Type DWV tube, copper drainage fittings, and soldered joints.
5. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

C. Aboveground, storm drainage piping NPS 8 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; heavy duty, hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Copper Type DWV tube, copper drainage fittings, and soldered joints.
5. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

D. Underground storm drainage piping NPS 6 and smaller shall be any of the following:

1. Extra heavy class, cast-iron soil pipe and fittings; gaskets; heavy-duty, hubless-piping couplings; and coupled joints.

2. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

E. Underground, storm drainage piping NPS 8 and larger shall be any of the following:

1. Extra heavy class, cast-iron soil pipe and fittings; heavy-duty, hubless-piping couplings; and coupled joints.

2. Dissimilar Pipe-Material Couplings: Shielded, pressure transition couplings.

FORCE MAINS

F. Aboveground storm drainage force mains NPS 1-1/2 and NPS 2 shall be any of the following:

1. Hard copper tube, Type L copper pressure fittings, and soldered joints.

2. Galvanized-steel pipe, pressure fittings, and threaded joints.

G. Aboveground storm drainage force mains NPS 2-1/2 to NPS 6 shall be any of the following:

1. Hard copper tube, Type L copper pressure fittings, and soldered joints.
2. Galvanized-steel pipe, pressure fittings, and threaded joints.
3. Fitting-type transition couplings if dissimilar pipe materials.

H. Underground storm drainage force mains NPS 4 and smaller shall be any of the following:

1. Hard copper tube; Type L copper pressure fittings; and soldered joints.
2. Ductile-iron, mechanical-joint piping and mechanical joints.
3. Ductile-iron, push-on-joint piping and push-on joints.
4. Ductile-iron, grooved-joint piping and grooved joints.
5. Fitting-type transition coupling for piping smaller than NPS 1-1/2 and pressure transition coupling for NPS 1-1/2 and larger if dissimilar pipe materials.

I. Underground storm drainage force mains NPS 5 and larger shall be any of the following:

1. Hard copper tube; Type L wrought-copper pressure fittings; and soldered joints.
2. Ductile-iron, mechanical-joint piping and mechanical joints.
3. Pressure transition couplings if dissimilar pipe materials.

END OF SECTION

SECTION 22 1423

STORM DRAINAGE 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. Roof drains – primary and secondary.
2. Miscellaneous storm drainage piping specialties
3. Cleanouts.
4. Backwater valves.
5. Trench drains.
6. Channel drainage systems.
7. Through-penetration firestop assemblies.
8. Flashing materials.

1.3 SUBMITTALS

A. Product data: for each type of product indicated.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-iron, general-purpose roof drains:

1. Combination primary and secondary (overflow) drain: zurn z164
2. Standard: asme a112.6.4, for general-purpose roof drains.
3. Body material: cast iron.
4. Dimension of body;
   a. Small sump 8”
   b. Medium sump 8” -12”
   c. Large sump 14”-16”
5. Combination flashing ring and gravel stop: required.
6. Flow control weir; required
7. Outlet: bottom or side. Coordinate in field
8. Outlet type: no hub threaded

9. Extension collars: required.
10. Underdeck clamp: required.
11. Expansion joint: required.
12. Sump receiver plate: required.
13. Dome material: cast iron.
14. Wire mesh: stainless steel or brass over dome.
15. Perforated gravel guard: stainless steel.
16. Vandal-proof dome: required.
17. Water dam: not required.

2.2 CLEANOUTS

A. Floor cleanouts:

1. Jay r. Smith model 4253:

    a. Josam company.
    b. Watts water technologies, inc.
    c. Zurn plumbing products group; light commercial products operation.

2. Standard: asme a112.36.2m.
3. Size: same as connected branch.
4. Type: cast-iron soil pipe with cast-iron ferrule or threaded, adjustable housing.
5. Body or ferrule material: cast iron.
6. Clamping device: required.
7. Closure: brass plug with tapered threads.
8. Frame and cover material and finish: nickel-bronze, copper alloy, polished bronze.
9. Frame and cover shape: round.
10. Top-loading classification: light duty.
11. Riser: astm a 74, service class, cast-iron drainage pipe fitting and riser to cleanout.

B. Test tees:

1. Manufacturers: subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

    a. Josam company.
    b. Smith, jay r. Mfg. Co.
    c. Watts water technologies, inc.
    d. Zurn plumbing products group; specification drainage operation.

2. Standard: asme a112.36.2m and astm a 74, astm a 888, or cispi 301, for cleanout test tees.
3. Size: same as connected drainage piping.
4. Body material: hub-and-spigot, cast-iron soil-pipe t-branch or hubless, cast-iron soil-pipe test tee as required to match connected piping.
5. Closure plug: countersunk, brass.
6. Closure plug size: same as or not more than one size smaller than cleanout size.

C. Wall cleanouts:

1. Jay r. Smith model 4472:

a. Josam company.
b. Watts water technologies, inc.
c. Zurn plumbing products group; specification drainage operation.

2. Standard: asme a112.36.2m, for cleanouts. Include wall access.
3. Size: same as connected drainage piping.
4. Body material: hubless as required to match connected piping.
5. Closure: countersunk or raised-head, drilled-and-threaded brass plug.
6. Closure plug size: same as or not more than one size smaller than cleanout size.
7. Wall access: round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall access: round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.3 BACKWATER VALVES

A. Cast-iron, horizontal backwater valves:
1. Standard: asme a112.14.1.
2. Size: same as connected piping.
3. Body material: cast iron.
4. Cover: cast iron with bolted or threaded access check valve.
5. End connections: no hub.
6. Check valve: removable, bronze, swing check, factory assembled or field modified to hang closed.
7. Extension: astm a 74, service class; full-size, cast-iron soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

B. Cast-iron, drain-outlet backwater valves:
1. Standard: asme a112.14.1.
2. Size: same as floor drain outlet.
3. Body material: cast iron or bronze made for vertical installation in bottom outlet of floor drain.
4. Check valve: removable ball float.
5. Inlet: threaded.
6. OUTLET: THREADED OR SPIGOT.

2.4 TRENCH DRAINS

A. Trench drains:
1. Standard: asme a112.6.3.
2. Body material: cast iron.
3. Flange: anchor.
4. Clamping device: required.
5. Outlet: bottom, end, or side coordinate in filed
6. Outlet type: inside caulk.
7. Grate material: ductile iron cast iron or stainless steel.
8. Grate finish: brushed stainless steel

9. Dimensions of frame and grate: refer to plan and notes.
10. Top-loading classification: extra-heavy duty.

2.5 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. THROUGH-PENETRATION FIRESTOP ASSEMBLIES:

1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, AVAILABLE MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

   a. PROSET SYSTEMS INC.

2. STANDARD: ASTM E 814, FOR THROUGH-PENETRATION FIRESTOP ASSEMBLIES.
3. CERTIFICATION AND LISTING: INTERTEK TESTING SERVICE NA FOR THROUGH-PENETRATION FIRESTOP ASSEMBLIES.
4. SIZE: SAME AS CONNECTED PIPE.
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.

2.6 FLASHING MATERIALS

A. Copper sheet: astm b 152/b 152m, 12 oz./sq. Ft..

B. 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.

C. Elastic membrane sheet: astm d 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: metal compatible with material and substrate being fastened.

E. Metal accessories: sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: astm b 32, lead-free alloy.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in division 07 sections.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

B. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to nps 4. Use nps 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping nps 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install test tees in vertical conductors and near floor.

F. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

G. Install through-penetration firestop assemblies in plastic conductors at concrete floor penetrations.

H. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.

I. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.

1. Comply with requirements in section 078413 "penetration firestopping."

J. All valves, fittings and specialties shall have a pressure class rating that exceeds the pressure of the system it is installed in.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in division 22 sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead sheets: burn joints of 6.0-lb/sq. Ft. Lead sheets, 0.0938-inch thickness or thicker. Solder joints of 4.0-lb/sq. Ft. Lead sheets, 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 the pipe size, with a minimum length of 10 inches and with 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 roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Fabricate and install flashing and pans, sumps, and other drainage shapes.

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

SECTION 22 1429

SUMP 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 basin covers.
3. Elevator Oil Minder Sump Pump.

B. Related Section:

1.3 SUBMITTALS

A. Product Data: For each type of pump, motor, control panel, basin cover. Include construction details, material descriptions, dimensions of individual components and profiles. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and Maintenance Data: For pumps and controls, to include in 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. UL Compliance: Comply with UL 778 for motor-operated water pumps.

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 pump manufacturer's written rigging instructions for handling.

PART 2 - PRODUCTS

2.1 SUBMERSIBLE SUMP PUMPS

A. Submersible, Fixed-Position, Single-Seal Sump Pumps:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Federal Pumps
   b. Bell & Gossett Domestic Pump; ITT Corporation.
   c. Goulds Pumps; ITT Corporation.
   d. Grundfos Pumps Corp.
   e. Liberty Pumps.
   f. Stancor, Inc.

2. Description: Factory-assembled and -tested sump-pump unit.
3. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 1.1-1.2 and HI 1.3.
4. Pump Casing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
5. Seal: Mechanical.
6. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
7. A name-plate showing the serial number, discharge GPM and Head of each pump shall be attached to the respective pump. The necessary wiring and controlling devices will be furnished and installed complete under the Electrical Division, unless otherwise specified.
8. Controls:

   a. Duplex Sump pump shall be controlled by a pedestal mounted float switch with built in alternator, Square D Company Class 9038 type AW-1 in a NEMA Type 4 watertight and dust-tight enclosure that is actuated by a minimum 7" stainless steel ball float and stainless steel rod guided above and below floor plate of pump.
   b. Provide a high-water alarm consisting of an auxiliary pedestal mounted single pole float switch equipped with a pedestal guide, gas-tight stainless steel rod and minimum 7" stainless steel ball float. Should the high-water alarm be activated, a warning signal shall be delivered to the Indicator Panel. With electric bell; 120-V ac, with transformer and contacts for remote alarm bell.
   c. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
   d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than 60 inches.

9. Control-Interface Features:

   a. Remote Alarm Contacts: For remote alarm interface.
   b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:

1) On-off status of pump.
2) Alarm status.

2.2 SUMP PUMP CAPACITIES AND CHARACTERISTICS

1. Refer to Drawing P-001 for unit specifications and capacities.

2.3 SUMP-PUMP BASIN COVERS

A. Angle frame and sump pit cover plate shall be provided and installed by the Plumbing Contractor. The Contractor shall coordinate the sump pit cover with the pump supplier such that it has all required openings for pumps and piping with openings having gaskets, seals, and bushings such as: access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.

1. Reinforcement: Steel or cast iron, capable of supporting foot traffic.

2.4 SUMP PUMP (ELEVATOR PIT)

A. Provide a Stancor pump in the elevator pit. Refer to Drawing P-001 for pump specifications and capacities.

B. Provide check valve on pump discharge. Provide 5 ft. extra cable rolled and clamped to allow for removal of pump from pit. Provide a local disconnect switch, and pump control panel where indicated on the drawings.

C. Pump Casing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.

D. Seal: Mechanical.

E. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.

F. A nameplate showing the serial number, discharge GPM and Head of each pump shall be attached to the respective pump. The necessary wiring devices will be furnished and installed complete under the Electrical Division, unless otherwise specified.

G. Controls:
1. Simplex sump pump shall be controlled by a pedestal mounted float switch that is actuated by a minimum 7" stainless steel ball float and stainless steel rod guided above and below floor plate of pump. Or a cable mounted floats for on off.
2. Provide a high-water alarm consisting of an auxiliary pedestal mounted single pole float switch, equipped with a pedestal guide, (or cable mounted float) gas-tight stainless steel rod and minimum 7" stainless steel ball float. Should the high-water alarm be activated, a warning signal shall be delivered to the Indicator Panel. With electric bell; 120-V ac, with transformer and contacts for remote alarm bell. The contacts shall be wired to the building BMS. Upon contact closure an alarm signal shall be initiated on the BMS which indicates high water and which elevator pit is being served. (i.e. Main elevator bank or sidewalk lift elevator)

3. Switch Type: float switch with float rods and rod buttons. Or cable mounted.
4. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
5. Control Panel CB 1000:
    a. Pumps serving non hydraulic elevators shall have pump control panels that are NEMA 4x suitable for pump control with optional dry remote alarm contacts for high water alarm.
    b. Stanmore model CB 1000. With pump running light, high level alarm, test and silence bottom and H-O-A selector switch.
    c. Pumps serving hydrolic elevators shall have a Nema 4x control panel 4x suitable for pump control with (2) optional dry remote alarm contacts for high water alarm and oil alarm. Provide stainless steel discriminating oil detector.
    d. Panel and pump system shall be Stancore oil minder model OM-50SR- ELV , with reset button, silence button RMS connector.
    e. Provide local disconnect switch for all pump systems.

2.5 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 22 Section "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

B. Motors for submersible pumps shall be hermetically sealed.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation and filling are specified in Division 31 Section "Earth Moving."

3.2 EXAMINATION

A. Examine roughing-in for plumbing piping to verify actual locations of storm drainage piping connections before sump pump installation.

3.3 INSTALLATION

A. Pump Installation Standards: Comply with HI 1.4 for installation of sump pumps.

B. The Contractor shall have the pump supplier verify the depth of each sump pit so that proper length of shaft shall be supplied.

3.4 CONNECTIONS

A. Comply with requirements for piping specified in Division 22 Section "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Make all required connections of pumps to the piping systems. Use flexible connectors to connect pumps to piping.

C. Install piping adjacent to equipment to allow service and maintenance.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. 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.

C. Pumps and controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.7 ADJUSTING

A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust control set points.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain controls and pumps.

END OF SECTION

SECTION 22 4213.13

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. Floor-mounted, bottom-outlet water closets.
2. Wall-mounted water closets.- Back outlet.
3. Flushometer valves.
4. Toilet seats.
5. Supports.

B. Related Requirements:

1. Section 221316 "Sanitary waste and vent piping
2. Section 221319 "sanitary waste piping specialties.

1.3 DEFINITIONS

A. Effective Flush Volume: Average of two reduced flushes and one full flush 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. Sustainable Design Submittals:

1. Product Data: For water consumption.

C. 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 six of each type.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

A. Water Closets, Floor Mounted, Bottom Outlet, Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Crane Plumbing, L.L.C.
c. Kohler Co.
d. Sloan Valve Company.
e. Zurn Industries, LLC.

2. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet or reverse trap.
d. Style: Flushometer valve.
e. Height: Child 10.25”.
f. Rim Contour: Modified elongated or regular.
g. Water Consumption: 1.28 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; back.
i. Color: White.

3. Bowl-to-Drain Connecting Fitting: ASME A112.4.3.
4. Flushometer Valve:model 6065 ADA compliant, hands free. .
5. Toilet Seat: IAPMO/ANSI Z124.5, Type A (residential), Shape 3 (elongated rim), open front, without cover, and shaped to match bowl.

2.2 WALL-MOUNTED WATER CLOSETS

A. Water Closets, Wall Mounted, Top Spud, Accessible

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Crane Plumbing, L.L.C.

c. Kohler Co.
d. Sloan Valve Company.
e. Zurn Industries, LLC.

2. 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.

3. Flushometer Valve: model 6065.111, ADA compliant
4. Toilet Seat: split front - oval
5. Support: Water closet carrier.
6. Water-Closet Mounting Height: Standard height 15" and Handicapped/elderly according to ICC/ANSI A117.1. where indicated on architectural plans.

2.3 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Church Seats; Bemis Manufacturing Company.
c. Kohler Co.
d. Zurn Industries, LLC.

2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Standard).
5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining, check.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.

2.4 SUPPORTS

A. Water Closet Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company.
b. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.

3. 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, GENERAL

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

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.

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

SECTION 22 4216.03

COMMERCIAL LAVATORIES AND FAUCETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

1. Engineered stone commercial lavatory units.
   a. Lavatory faucets.
   b. Soap dispensers.

2. Vitreous China – wall hung

3. Shields and Guards

1.2 RELATED SECTIONS

1. 221116 "Domestic Water Piping Specialties"

2. 221119 "Domestic Water Piping Specialties"

1.3 REFERENCES

A. American Society of Sanitary Engineering (ASSE):

1. ASSE 1070 - Water Temperature Limiting Devices.

B. American Society of Mechanical Engineers (ASME):

1. ASME A112.18.1 - Plumbing Fixture Fittings.

C. ASTM International (ASTM):

1. ASTM C 170 - Standard Test Method for Compressive Strength of Dimension Stone.

2. ASTM D 570 - Standard Test Method for Water Absorption of Plastics.

3. ASTM D 785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.

4. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

5. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. International Code Council (ICC):

1. ICC/ANSI A117.1 – Accessible and Usable Buildings and Facilities.

E. National Fire Protection Association (NFPA):

1. NFPA 70 – National Electrical Code.

F. Underwriters Laboratories, Inc. (UL):

1. UL 723 - Test For Surface Burning Characteristics of Building Materials.

2. UL 1951 - Electric Plumbing Accessories.

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 lavatories.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:

1. Product Data: For water consumption.

C. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.5 INFORMATION SUBMITTALS

A. Sample warranty.

B. Manufacturer's certificates.

C. Indoor environmental quality certificates.

1.6 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.

1.7 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. 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.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum 5 years experience in the manufacture of plumbing fixtures. Manufacturers seeking approval must submit the following:

1. Product data, including test data from qualified independent testing agency indicating compliance with requirements.

2. Samples of each component of product specified.

3. List of successful installations of similar products available for evaluation by Architect.

4. Submit substitution request not less than 15 days prior to bid date.

B. Source Limitations: Obtain each type of plumbing fixture and compatible accessories through one source from a single approved manufacturer.

C. Accessibility Requirements: Comply with requirements of ADA/ABA and with requirements of authorities having jurisdiction.

D. Water Flow and Consumption Requirements: Comply with EPACT.

E. Drinking Water Standard: Certified to NSF/ANSI 372.

F. Electrical Components: Listed and labeled per NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

G. Indoor Environmental Quality Certification: Provide certificate indicated that products have been certified under the following programs, or a comparable certification acceptable to Owner:

1. GREENGUARD Indoor Air Quality Certified.

2. GREENGUARD Certified for Children and Schools.

1.9 WARRANTY

A. Special Manufacturer’s Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship within the following periods:

1. Engineered natural quartz material: 10 years.

2. Faucets: 1 year.

3. WashBar: 1 year

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products of Bradley Corporation

1. Submit requests for substitution in accordance with Instructions to Bidders and Division 01 General Requirements.

B. MATERIALS

2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory P-2A: Ledge back, vitreous china, wall mounted.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Standard.
   b. Kohler Co.
   c. Peerless Pottery Sales, Inc.
   d. Sloan Valve Company.

2. Fixture:
   a. Standard: ASME A112.19.2/CSA B45.1.
   b. Type: For wall hanging.
   c. Nominal Size: Oval, 18 by 16 inches
   d. Faucet-Hole Punching: One hole.
   e. Faucet-Hole Location: Top.
   f. Color: White.
   g. Mounting Material: Chair carrier.

3. Faucet: Solid-Brass, Automatically Operated Lavatory Faucets" Article

4. Support: Type II, concealed-arm lavatory carrier with escutcheons..

5. Lavatory Mounting Height: Standard.

2.3 MULTI-STATION LAVATORY UNITS

A. Lavatory: Wall-mounted rectilinear, level-surface lavatory deck with sleek edges, molded from engineered stone material to create a seamless and integral elongated basin, with stainless steel enclosed pedestal cabinet.

1. Basis of Design Manufacturer/Model: Bradley, Verge Lavatory System, Model LVRD2.

2. Number of Wash Stations: 2.

3. Unit Length: 60 inches.

4. Soap Dispenser: Included.

5. Water Supply: Thermostatic mixing valve assembly.

6. Color: As selected by Architect from manufacturer's full line. Submit color chart for review and approval.

7. Rim Mounting Height: As indicated.

8. SENSOR-OPERATED Wash Bar

2.4 SENSOR-OPERATED LAVATORY FAUCETS

A. Capacitive-Sensor-Operated Faucet with Remote Tempering Control: Vandal-resistant accessible faucet meeting ASME A112.18.1/CSA B125. ADA/ANSI A117.1 complaint.

1. Basis of Design Manufacturer/Model: Bradley CAP-DCA.

2. Body: Polished chrome plated commercial solid cast brass spout.

3. Aerator: Flow rate 0.35 gpm at operating range of 20 to 80 psi

4. Tempered Water Supply: Single thermostatic mixing valve.

5. Sensor Module: Water-conserving, vandal-resistant adjustable infra red sensor unit with timing turn-off delay and stationary object automatic timed cutoff, with battery diagnostic audible signal, remote serviceable.
   a. Adjustable Sensing Distance: 0 to 3-1/2 inch (0 to 88.9 mm).

6. Power Supply: 120/24 VAC plug-in transformer.

7. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with stop/strainer/check valves, and flexible stainless steel connectors.

2.5 SOAP DISPENSERS

A. Sensored Soap Dispenser: Deck-mounted, sensor-operated, chrome-plated plastic, with LED soap level indicators, with 3 dispenser 120VAC power pack, 27 oz. (798 mL) capacity bottle 1000 shot soap.

1. Basis of Design Manufacturer/Model: Bradley, Model 6315-KT0000.

2.6 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Engineered Brass Co.
   b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
   c. McGuire Manufacturing Co., Inc.
   d. Plumberex Specialty Products Inc.
   e. TCI Products.
   f. TRUEBRO, Inc.

g. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. TRUEBRO, Inc.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble fixtures, accessories, and associated fittings and trim in accordance with manufacturer's instructions.

B. Install fixture supports firmly attached to building structure.

C. Install fixtures level, plumb, and in accordance with manufacturer's rough-in instructions.

D. Install water supply piping. Provide stop on each supply in readily serviceable location. Fasten supply piping to supports or substrate.

E. Install trap and waste piping to each fixture.

F. Install escutcheons at exposed piping penetrations in finished locations and within cabinets.

G. Seal joints between fixtures and walls, floors, and countertops with mildew-resistant silicone sealant meeting requirements in Division 07 Section "Joint Sealants."

H. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."

I. Exposed metal trim and roughing shall be chrome plated nickel brass. Chrome plated cast brass ‘p’ traps with screw plug cleanout, slip-joint inlet and female cast swivel threaded elbow outlet. Chrome plated brass nipple to wall with chrome plated escutcheon. Swing spouts shall have 140° swing limit stops.

J. Wall hung lavatories, except as specifically noted otherwise, shall be supported on concealed chair carriers, single or double as required, with steel uprights, adjustable concealed arms and sleeves, alignment truss, and block bases. Carrier arms shall be provided with leveling device.

K. Provide chrome plated traps, nipples, stop valves, and supplies for fixtures supplied by other sections.

L. Provide protection shield guards on all exposed piping under sinks and lavatories.

3.2 CLEANING AND PROTECTION

A. Repair or replace defective work, including damaged fixtures and components.

B. At time of Substantial Completion:

1. Clean unit surfaces, test fixtures, and leave in ready-to-use condition.

2. Install new batteries in battery-operated devices.

3. Fill soap dispensers.

4. Turn over keys, tools, maintenance instructions, and maintenance stock to Owner.

C. Protect units with water-resistant temporary covering. Do not allow temporary use of plumbing fixtures. Remove protection at Substantial Completion and dispose.

3.3 TESTING AND ADJUSTING

A. Set field-adjustable temperature set points of temperature-actuated water mixing valves. Adjust set point within allowable temperature range.

B. Test and adjust installation.

C. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

D. Operate and adjust controls. Replace damaged and malfunctioning units and controls.

E. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

F. Replace washers and seals of leaking and dripping faucets and stops.

END OF SECTION

SECTION 22 4216.16

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 basins.
2. Utility sinks.
3. Handwash sinks.
4. Laminar-flow, faucet-spout outlets.
5. Supports.

B. Related Requirements:

1. Section 224100 "Residential Plumbing Fixtures" for residential sinks.

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.

B. Sustainable Design Submittals:

1. Product Data: For water consumption.

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 BASINS

A. Service Basins: Terrazzo, floor mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Fiat Products
    b. Acorn Engineering Company; a Division of Morris Group International.
    c. Florestone Products Co., Inc.
    d. Stern-Williams Co., Inc.

2. Fixture:

    a. Standard: IAPMO PS 99.
    b. Shape: Square Five sided.
    c. Nominal Size: 36 by 36 inches.
    d. Height: 12 inches with dropped front.
    e. Tiling Flange: On two sides.
    f. Rim Guard: On front top surfaces.
    g. Color: Not applicable.
    h. Drain: Grid with NPS 3 outlet.

3. Mounting: On floor and flush to wall.
4. Faucet: Speakman commander SC-5811, cast brass, polished chrome, with hose and pail hook and wall brace.
    a. Integral stops.
    b. ¾” treaded end connection
    c. Brass top brace assembly
    d. Adjustable treaded brass wall flanges.
5. Optional components:
    a. Mop service basin fitting
    b. 5’ Hose and hose wall bracket
    c. Wall guards
    d. Pail hook and wall brace
    e. Check valve in swivel assembly
    f. 5-year warranty

2.2 UTILITY SINKS

A. Utility Sinks: Stainless steel, double counter mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Elkay Manufacturing Co.
    b. Griffin Products, Inc.
    c. Just Manufacturing.

2. Fixture:

    a. Standard: ASME A112.19.3/CSA B45.4.
    b. Type: double bowl
    c. Number of Compartments: two
    d. Overall Dimensions: 37 ¼””x17”x7 5/8” deep
    e. Metal: -304 stainless
    f. Thickness: 18 gauge
    g. Mounting: countertop – drop in
    h.
    i. Compartment 1:
        1) 16”x11.5”x7.5”
        2) Drain: Grid 3 ½” with NPS 1 1/2 tailpiece and twist drain
        3) Drain Location: Centered in compartment
    j. Compartment 2:
        1) 9.25”x12”x3.5”
        2) Drain: Grid 2” with NPS 1 1/2 tailpiece and twist drain
        3) Drain Location: Centered in compartment

3. Supply Fittings:

    a. Standard: ASME A112.18.1/CSA B125.1.
    b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

        1) Operation: Wheel handle.
        2) Risers: NPS 1/2 ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

4. Waste Fittings:

    a. Standard: ASME A112.18.2/CSA B125.2.
    b. Trap(s):two

        1) Size: NPS 1 ½” each
        2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated brass or wall flange.

5. Faucet:
    a. Elkay model LKD2439C, Arc spout 2-5/8” lever handles ADA compliant, 1.5 max flow rate with ceramic disk valves.
    b. 3 hole
    c. 11” height

d. Quarter turn ceramic disc valves
e. Facet holes 1- ¼”
f. 360 swivel

6. Accessories:
a. LKD2439 C faucet
b. LK1141A bubbler
c. LK35 strainer
d. LK8 drain fitting

B. Utility Sinks: Stainless steel, counter mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Elkay Manufacturing Co.
b. Griffin Products, Inc.
c. Just Manufacturing.

2. Fixture:

a. Standard: ASME A112.19.3/CSA B45.4.
b. Type: Ledge back.
c. Number of Compartments: One.
d. Overall Dimensions: 25”x22”x5 1/2” deep
e. Metal /Thickness: 304 stainless / 18 gauge
f. Compartment:
1) Drain: Grid 3 ½” with NPS 1 1/2 tailpiece and twist drain
2) Drain Location: rear Centered in compartment
g. Mounting: countertop – drop in

3. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Wheel handle.
2) Risers: NPS 1/2 ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

4. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap(s):

1) Size: NPS 1 ½”
2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated brass or wall flange.

5. Faucet:

a. Elkay model LKD2439C, Arc spout 2-5/8" lever handles ADA compliant, 1.5 max flow rate with ceramic disk valves.
b. 3 hole
c. 11" height
d. Quarter turn ceramic disc valves
e. Facet holes 1- ¼"
f. 360 swivel

6. Accessories:
   a. LKD2439 C faucet
   b. LK35 strainer
   c. LK8 drain fitting
7.

C. Utility Sinks: Stainless steel, counter mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Elkay Manufacturing Co.
   b. Griffin Products, Inc.
   c. Just Manufacturing.

2. Fixture:

   a. Standard: ASME A112.19.3/CSA B45.4.
   b. Type: Ledge back.
   c. Number of Compartments: One.
   d. Overall Dimensions: 22"x19.5"x51/2" deep
   e. Metal /Thickness: 304 stainless / 18 gauge
   f. Compartment:
      1) Drain: Grid 3 ½" with NPS 1 1/2 tailpiece and twist drain
      2) Drain Location: rear Centered in compartment
   g. Mounting: countertop – drop in

3. Supply Fittings:

   a. Standard: ASME A112.18.1/CSA B125.1.
   b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

      1) Operation: Wheel handle.
      2) Risers: NPS 1/2 ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

4. Waste Fittings:

   a. Standard: ASME A112.18.2/CSA B125.2.
   b. Trap(s):

      1) Size: NPS 1 ½"

2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated brass or wall flange.

5. Faucet:
   a. Elkay model LKD2439C, Arc spout 2-5/8" lever handles ADA compliant, 1.5 max flow rate with ceramic disk valves.
   b. 3 hole
   c. 11" height
   d. Quarter turn ceramic disc valves
   e. Facet holes 1- ¼"
   f. 360 swivel
6. Accessories:
   a. LKD2439 C faucet
   b. LK35 strainer
   c. LK8 drain fitting

D. Utility Sinks : Stainless steel, freestanding. (Not Used)

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Tabco.
   b. AERO Manufacturing Company.
   c. Elkay Manufacturing Co.
   d. Just Manufacturing.
   e. Medina

2. Fixture:

   a. Standard: ASME A112.19.3/CSA B45.4.
   b. Type: With backsplash.
   c. Number of Compartments: One.
   d. Overall Dimensions: 27"x23"
   e. Metal Thickness: 0.063 inch.
   f. Compartment:
      1) Drain: Grid with NPS 2 tailpiece and twist drain.
      2) Drain Location: Centered in compartment.
   g. 10 yearr warranty
   h. 4" back splash
   i. 16 gage stainless steel construction
   j. Pull down sprayer

3. Supports: Adjustable-length stainless steel legs.
4. Faucet: Matched, Deck mount with pull down sprayer by Medina

   a. Number Required: One.
   b. Mounting: On backsplash.

5. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Wheel handle.
2) Risers: NPS 1/2, ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

6. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap:

1) Size: NPS 2.
2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.

2.3 HANDWASH SINKS

A. Handwash Sinks: Stainless steel, wall mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AERO Manufacturing Company.
b. Elkay Manufacturing Co.
c. Sloan Valve Company.

2. Fixture: EWMA A6020

a. Standards: ASME A112.19.3/CSA B45.4 and NSF/ANSI 2.
b. Type: Basin with squar corners, high back for faucet, and support brackets.
c. Nominal Size: 60” x 20” x 25 3/4”
d. Bowl size: 57” x 16 ½” x 8”
e. Drain: 3 ½”
f. Material; 14 gauge stainless steel.

3. Faucet: (3) sensor faucets LKB722c with – no touch electronic sensor

4. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Wheel handle.
2) Risers: NPS 1/2, ASME A112.18.6, braided or corrugated stainless-steel flexible hose.
3) Mechanical mixing valve

5. Waste Fittings:

    a. Standard: ASME A112.18.2/CSA B125.2.
    b. Trap:

        1) Size: NPS 2.
        2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.

6. Support: Type II sink carrier.
7. Mounting Height: as per plan.

2.4 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AM Conservation Group, Inc.
2. Chronomite Laboratories, Inc; a division of Morris Group International.
3. NEOPERL, Inc.
4. T&S Brass and Bronze Works, Inc.

C. 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.

2.5 SUPPORTS

A. Type II Sink Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg Co; a division of Morris Group International.
    b. Josam Company.
    c. Wade Drains.
    d. WATTS.
    e. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.

2.6 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.

2.7 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Engineered Brass Co.
b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
c. McGuire Manufacturing Co., Inc.
d. Plumberex Specialty Products Inc.
e. TCI Products.
f. TRUEBRO, Inc.
g. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. TRUEBRO, Inc.

2.8 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 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 valves if supply stops are not specified with sink.
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."

I. Provide protective shield guard for art room sinks and all Lavatories

J. Install clay / solids interceptors at all art room utility sinks.

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."

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

SECTION 22 4716

WATER COOLERS

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 pressure water coolers with bottle filler and related components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of pressure water cooler.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Sustainable Design Submittals:

1. Product Data: For water consumption.

C. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For pressure water coolers to include in maintenance manuals.

1.5 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. Filter Cartridges: Equal to 10 percent of quantity installed for each type and size indicated, but no fewer than 5 of each.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS (P-5)

A. Pressure Water Coolers: Wall mounted, wheelchair accessible, with bottle filler, vandal resistant.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Elkay Manufacturing Co.
    b. Halsey Taylor.
    c. Haws Corporation.
    d. Larco Inc.
    e. Oasis International.

2. Standards:

    a. Comply with NSF 61 and NSF 372.
    b. Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.
    c. Comply with ICC A117.1.

3. Cabinet: single-level with attached cabinets and skirt kit, all stainless steel.
4. Bubbler: One, with adjustable stream regulator.
5. Control: Push button
6. Bottle Filler: Push-button activation with 20-second automatic shutoff timer. Fill rate 0.5 to 1.5 gpm.
7. Drain: Grid with NPS 1-1/4 tailpiece.
8. Supply: NPS 3/8 with shutoff valve.
9. Ventilation Grille: Stainless steel.
10. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 brass P-trap.
11. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
12. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

    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.

13. Capacities and Characteristics:

    a. Cooled Water: 5 gph.
    b. Ambient-Air Temperature: 90 deg F.
    c. Inlet-Water Temperature: 80 deg F.
    d. Cooled-Water Temperature: 50 deg F.
    e. Cooled-Water Storage: .
    f. Electrical Characteristics: refer to drawing schedule
14. Support: Type I Water or Cooler Carrier Type II Water Cooler Carrier as recommended by the manufacture.
15. Water Cooler Mounting Height: Handicapped/elderly according to ICC A117.1.
16. Cabinet: All stainless steel integral with drinking fountain water cooler.
17. Bottle filler: electronic hands-free activation with 20-second automatic shut-off timer. Fill rate 0.5 to 1.5 gpm.

18. Support: Mounting frame for attaching to substrate.

2.2 SUPPORTS

A. Type I Water Cooler Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. Wade Drains.
d. WATTS.
e. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.

B. Type II Water Cooler Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. Wade Drains.
d. WATTS.
e. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Set freestanding pressure water coolers on floor.

C. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

D. Install mounting frames, affixed to building construction, and attach recessed, pressure water coolers, and in-wall bottle filling stations to mounting frames.

E. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523.12 "Valves for Plumbing Piping" and Section 220523.15

F. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

H. Seal joints between fixtures 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."

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. Install ball shutoff valve on water supply to each fixture. Install valve upstream from filter for water cooler. Comply with valve requirements specified in Section 220523.12 "Valves for Plumbing Piping"

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust pressure water-cooler temperature settings.

3.5 CLEANING

A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 230500
COMMON WORK RESUILTS 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. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. Equipment installation requirements common to equipment sections.
8. Painting and finishing.
9. Concrete bases.
10. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Mechanical sleeve seals.
3. Escutcheons.

B. Welding certificates.

C. Shop Drawing Review Stamp Definitions

1. “No Exceptions Taken” means that the shop drawing is correct as to performance, capacity, etc. and substantial conformance to the contract drawings and specifications. Fabrication and/or purchase may commence.
2. “Make Corrections Noted” means that the shop drawing is correct as to performance capacity, etc. and substantial conformance to the contract drawings and/or specifications, subject to and in compliance with the annotations and/or corrections indicated on the shop drawing. Fabrication and/or purchase may commence.
3. “Amend and Resubmit” means that the comments and/or correction are so extensive and important that the reviewer wants to see how the comments and/or corrections are resolved prior to release for fabrication and/or purchase. Fabrications and/or purchase may not commence.
4. “Rejected” means that the shop drawing does not comply or conform to the contract drawings and/or specifications. Fabrication and/or purchase may not commence.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers:

    a. Capitol Manufacturing Co.
    b. Watts Industries, Inc.; Water Products Div.
    c. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Manufacturers:

    a. Capitol Manufacturing Co.
    b. Epco Sales, Inc.
    c. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:

a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Metraflex Co.
c. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. One-Piece, Floor-Plate Type: Cast-iron floor plate.

2.8 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 GENERAL CONSTRUCTION – COMMON REQUIREMENTS

A. Work must be completed in phases to facilitate ongoing occupancy and building operations during the entire construction period. Provide temporary partitions or other suitable barriers to separate work areas from occupied spaces. The timing and location of each work area shall be scheduled with the owner prior to initiating the work.

B. Provide all materials and labor required to remove and re-install the existing ceiling tiles and grids in each area of work as required to suit demolition and new work. Tiles and grids shall be stored in an area designated by the owner. Repair any tiles or grids damaged during the removal and reinstallation process.

C. Coordinate removal and re-installation of existing light fixtures with the electrical contractor.

D. Provide all cutting and patching of sheetrock walls, partitions, ceilings, etc. As required to facilitate the mechanical and electrical work. Patching materials and methods shall match existing construction.

E. Paint all existing surfaces damaged by new work with new latex based paint with color to match the existing. Prepare and prime and prepare all new and existing surfaces in accordance with the manufacturers recommendations prior to finish painting.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Insulated Piping: One-piece, stamped-steel type with spring clips.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
e. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
f. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
g. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

O. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

P. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten

bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Q. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

S. Verify final equipment locations for roughing-in.

T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

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. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project. Unless otherwise indicated in TRADE sections: air handling units, fans, pumps, compressors and other rotating machinery, and boilers, shall be mounted on concrete pads which shall be furnished and installed as part of work of DIVISION 3, CONCRETE.

B.

1. Pads shall be four-inch thick minimum and shall extend six inches beyond equipment footprint in all directions. Top edge of pads shall be chamfered.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi , 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.9 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

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.

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: NEMA Premium.

C. Service Factor: 1.15.

D. Rotor: Random-wound, squirrel cage.

E. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating.

G. Insulation: Class F.

H. 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.

I. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, 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.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 230519
METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermometers.
2. Gages.
3. Test plugs.

1.3 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated; include performance curves.

B. Shop Drawings: Schedule for thermometers, gages, and flowmeters indicating manufacturer's number, scale range, and location for each.

C. Operation and Maintenance Data: For flowmeters and thermal-energy meters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Trerice, H. O. Co.
2. Weiss Instruments, Inc.
3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Case: Die-cast aluminum or brass, 9 inches long.

C. Tube: Red or blue reading, organic-liquid filled, with magnifying lens.

D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.

E. Window: Glass or plastic.

F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

G. Stem: Copper-plated steel, aluminum, or brass for thermowell installation and of length to suit installation.

H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.2 DIRECT-MOUNTING, VAPOR-ACTUATED DIAL THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Trerice, H. O. Co.
2. Weiss Instruments, Inc.
3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Case: Liquid-filled type, drawn steel or cast aluminum, 6-inch diameter.

C. Element: Bourdon tube or other type of pressure element.

D. Movement: Mechanical, connecting element and pointer.

E. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.

F. Pointer: Red or other dark-color metal.

G. Window: Glass or plastic.

H. Ring: Brass.

I. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

J. Thermal System: Liquid- or mercury-filled bulb in copper-plated steel, aluminum, or brass stem for thermowell installation and of length to suit installation.

K. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.3 REMOTE-MOUNTING, VAPOR-ACTUATED DIAL THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Trerice, H. O. Co.
2. Weiss Instruments, Inc.
3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Case: Dry type, drawn steel or cast aluminum, 6-inch diameter with holes for panel mounting.

C. Element: Bourdon tube or other type of pressure element.

D. Movement: Mechanical, connecting element and pointer.

E. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.

F. Pointer: Red or other dark-color metal.

G. Window: Glass or plastic.

H. Ring: Brass.

I. Connector: Bottom union type.

J. Thermal System: Liquid- or mercury-filled bulb in copper-plated steel, aluminum, or brass stem for thermowell installation and of length to suit installation.

K. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.4 THERMOWELLS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Trerice, H. O. Co.
2. Weiss Instruments, Inc.
3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.5 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Trerice, H. O. Co.
2. Weiss Instruments, Inc.

3. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Dry type, drawn steel or cast aluminum, 6-inch diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Red or other dark-color metal.
7. Window: Glass or plastic.
8. Ring: Brass.
9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure. (for services with potential vacuum).
11. Range for Fluids under Pressure: Two times operating pressure.

C. Remote-Mounting, Dial-Type Pressure Gages: ASME B40.100, indicating-dial type.

1. Case: Dry type, drawn steel or cast aluminum, 6-inch diameter with holes for panel mounting.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Red or other dark-color metal.
7. Window: Glass or plastic.
8. Ring: Brass.
9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range for Fluids under Pressure: Two times operating pressure.

D. Pressure-Gage Fittings:

1. Valves: NPS 1/4 brass or stainless-steel needle type.
2. Syphons: NPS 1/4 coil of brass tubing with threaded ends.
3. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.6 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. National Meter, Inc.
2. Trerice, H. O. Co.
3. Watts Industries, Inc.; Water Products Div.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for air, water, oil, or gas service at 20 to 200 deg F shall be CR.
2. Insert material for air or water service at minus 30 to plus 275 deg F shall be EPDM.

PART 3 - EXECUTION

3.1 THERMOMETER APPLICATIONS

A. Install liquid-in-glass thermometers in the following locations:

1. Inlet and outlet of each hydronic coil.
2. Inlet and outlet of each hydronic boiler and chiller.
3. Inlet and outlet of each hydronic coil in air-handling units and built-up central systems.
4. Where indicated on plans/details.

B. Install dry liquid-filled-case-type, vapor-actuated dial thermometers at suction and discharge of each pump.

C. Provide the following temperature ranges for thermometers:

1. Heating Hot Water: 30 to 240 deg F, with 2-degree scale divisions .
2. Chilled Water: 0 to 100 deg F, with 2-degree scale divisions .

3.2 GAGE APPLICATIONS

A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve.

B. Install dryliquid-filled-case-type pressure gages at chilled- and condenser-water inlets and outlets of chillers.

C. Install dryliquid-filled-case-type pressure gages at suction and discharge of each pump.

3.3 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install remote-mounting dial thermometers on panel, with tubing connecting panel and thermometer bulb supported to prevent kinks. Use minimum tubing length.

C. Install thermowells with socket extending to center of pipe and in vertical position in piping tees where thermometers are indicated.

D. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

E. Install remote-mounting pressure gages on panel.

F. Install needle-valve and snubber fitting in piping for each pressure gage for fluids (except steam).

G. Install needle-valve and syphon fitting in piping for each pressure gage for steam.

H. Install test plugs in tees in piping.

I. Install permanent indicators on walls or brackets in accessible and readable positions.

J. Install connection fittings for attachment to portable indicators in accessible locations.

3.4 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance for meters, gages, machines, and equipment.

3.5 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION

SECTION 230523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze angle valves.
2. Bronze ball valves.
3. Iron, single-flange butterfly valves.
4. Bronze swing check valves.

B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.

4. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug-valve head.
5. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Milwaukee Valve Company.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 150 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Crane Co.; Crane Valve Group; Stockham Division.
b. Milwaukee Valve Company.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

2.4 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Milwaukee Valve Company.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

B. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Milwaukee Valve Company.
b. NIBCO INC.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 300 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for ball butterfly gate globe and plug valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

F. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service: Globe.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in piping specification.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in piping specifications.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends.
6. For Steel Piping, NPS 5 and Larger: Flanged ends.

END OF SECTION

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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for HVAC system piping and equipment:

1. Pipe stands.
2. Equipment supports.

B. Related Sections include the following:

1. Division 23 Section "Vibration Controls for HVAC" for vibration isolation devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.

3. Powder-actuated fastener systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Pipe stands. Include Product Data for components.
2. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

    a. Hilti, Inc.
    b. ITW Ramset/Red Head.
    c. Powers Fasteners.

2.3 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

1. Manufacturers:

    a. ERICO/Michigan Hanger Co.
    b. MIRO Industries.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

1. Manufacturers:

    a. MIRO Industries.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Manufacturers:

    a. ERICO/Michigan Hanger Co.
    b. MIRO Industries.
    c. Portable Pipe Hangers.

2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Manufacturers:

    a. Portable Pipe Hangers.

2. Bases: One or more plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.4 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 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. 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.

B. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.

C. Install hangers and supports complete with necessary 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 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 so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

J. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and 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.

5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust supports to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

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. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

D. 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: Brass, 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.

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 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, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: As per OSHA

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. 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 cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
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: Brass, 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 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: Approximately 4 by 7 inches .
2. Fasteners: Brass grommet and wireReinforced 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 is specified in Division 09 Section "Interior Painting."

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 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.
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: (as per ANSI13.1 and OSHA requirements)

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. Chilled Water: 1-1/2 inches, round.

2. Valve-Tag Color:

a. Chilled Water: Natural.

3. Letter Color:

a. Chilled 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

SECTION 230555
MOTOR CONTROLS AND VFD'S

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 specification is to cover a complete Variable Frequency Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use with both induction (asynchronous) motors, permanent magnet motors, synchronous reluctance motor (SynRM) and permanent magnet-assisted synchronous reluctance motor (PMa-SynRM/EC Titanium).

B. The drive manufacturer shall supply the drive and all necessary options as specified. All drives installed on this project shall be from the same manufacturer and have a common user interface (control panel). Drives that are manufactured by a third party and "brand labeled" shall not be acceptable.

1.3 SUBMITTALS

A. Submittals shall include the following information:

1. Outline dimensions, conduit entry locations and weights.

2. Electrical diagrams must be drive package specific and generic drawings are not allowed. Hand marked or manually modified diagrams are not acceptable

3. HCAI (formerly OSHPD) preapproval, seismic certification, and installation requirements where applicable.

4. Complete technical product description with complete list of options provided. Any portions of this specification not met must be clearly indicated or the supplier and contractor shall be liable to provide all additional components required to meet this specification.

5. Building Information Modeling (BIM) objects shall be available online.

B. Qualification Data: For testing agency.

C. Source quality-control test reports.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For field-installed motors to include in emergency, operation, and maintenance manuals.

F. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

G. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that dip switch settings for motor running overload protection suit actual motor to be protected.

1.4 QUALITY ASSURANCE

A. Referenced Standards and Guidelines:

1. Institute of Electrical and Electronic Engineers (IEEE)
   a. IEEE 519-2014, IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems

2. Underwriters Laboratories (as appropriate)
   a. UL 508A
   b. UL 61800-5-1

3. National Electric Code (NEC)
   a. NEC 430.120, Adjustable-Speed Drive Systems

4. CSA Group
   a. CSA C22.2 No. 274

5. International Building Code (IBC)
   a. IBC 2018 Seismic – referencing ASCE 7-16 and ICC AC-156

B. Qualifications:

1. Drives shall be UL labeled as a complete assembly. The base VFD shall be UL listed for 100 kA SCCR when installed in accordance with the manufacturer's guidelines.

2. The base drive shall be CE and meet EN 61800-3 for the First Environment restricted distribution (Category C2).

3. The base drive shall be seismically certified per 2018 International Building Code (IBC) with a seismic importance factor of 1.5, and minimum 2.5 S_{DS} rating. Seismic certification of equipment and components shall also be provided by HCAI (formerly OSHPD)preapproval.

4. The base drive shall be SEMI-F47 certified. The drive must tolerate voltage sags to 50% for up to 0.2 seconds, sags to 70% for up to 0.5 seconds, and sags to 80% for up to one second.

5. Acceptable Manufacturers
   a. ABB ACH Series.
   b. Alternate manufacturer's requests shall be submitted in writing to the Engineer for approval at least 20 working days prior to bid. Approval does not relieve the supplier of specification requirements.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

D. Source Limitations: Obtain field-installed motors through one source from a single manufacturer.

E. Product Options for Field-Installed Motors: Drawings indicate size, profiles, and dimensional requirements of motors and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

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.

G. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate features of motors & motor controllers/VFD’s, installed units, and accessory devices and features that comply with the following:

1. Compatible with the following:

a. Magnetic controllers.
b. Multispeed controllers.
c. Reduced-voltage controllers.
d. Variable Speed Drives

2. Designed and labeled for use with variable frequency controllers, and suitable for use throughout speed range without overheating.
3. Matched to torque and horsepower requirements of the load.

4. Matched to ratings and characteristics of supply circuit and required control sequence.

B. Electrical Service: All motors shall be 60 Hertz unless otherwise noted. Refer to Electrical Specifications for required electrical characteristics.

C. Visible Nameplate: Indicating manufacturer's name and model number, motor horsepower, RPM, frame size, voltage, phase, cycles, full load amps, insulation system class, service factor, maximum ambient temperature, temperature rise at rated horsepower, minimum efficiency, power factor.

D. Suitable starting and controlling equipment and devices shall be furnished and installed as specified hereinafter and as shown on the Drawings. The starting equipment shall be arranged, gen-

erally, in control groups, or in certain cases, as isolated combination starters as specified or indicated. The Heating Ventilating and Air Conditioning Sequences of Operation, drawings and specifications shall be referred to for the manner of control, operation and monitoring of motors and the electrically operated equipment.

F. Starting equipment and devices furnished under this Section shall be installed by the Electrical Contractor. The Electrical Contractor shall also do all wiring necessary to supply power to the electric motors provided under this Section, including connections from the starters to the motors.

G. This Contractor shall furnish and install all wiring between control devices and controlled equipment furnished under this Section, including interlock control wiring between motor starters, and all automatic temperature control wiring. All wiring shall be installed in conformance with applicable codes and the requirements of the Electrical Division of the Specifications.

H. The Electrical Contractor shall furnish a 120-volt power source to temperature control panels and equipment requiring a separate 120 volt control power source. Power for control circuits for all devices connecting to motor starters shall be obtained from 120-volt control transformers provided in each starter operating at other than 120 volts. Provide transformers for all low voltage control systems as required.

I. Furnish detailed composite wiring diagrams and such other information necessary to assure the proper connection, operation and control of motorized equipment, including interlocks, automatic controls, safety controls and all auxiliary circuits.

J. All control units shall be furnished with a nameplate indicating which device or equipment it controls, the voltage. Additional nameplates on each push button, selector switch and pilot light indicating their functions shall be provided. Nameplates shall be laminated phenolic with white letters on black background.

PART 2 - PRODUCTS

2.1 VARIABLE FREQUENCY CONTROLLERS (VFD'S)

A. The drive package as specified herein and defined on the drive schedule shall be enclosed in a UL Type enclosure.

B. The drive shall provide full rated output from a line of +10% to -15% of nominal voltage across an ambient temperature range of -15 to 40° C (5 to 104° F).

C. All drives shall utilize the same Advanced Control Panel (keypad) user interface.

1. Plain English text
    a. The display shall be in complete English words for programming and fault diagnostics.
    b. Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch or vibration trip. Customized terms, such as: AHU-1 End Switch or CT-2 Vibration shall also be available.

2. The control panel shall include at minimum the followings controls:
   a. Four navigation keys (Up, Down, Left, Right) and two soft keys.
   b. Hand-Off-Auto selection, Fault Reset, and manual speed control.
   c. A Help key shall include assistance for programming and troubleshooting.

3. There shall be a built-in time clock in the control panel with 10-year battery backup.

4. I/O Summary display with a single screen shall indicate and provide:
   a. The status/values of all analog inputs, analog outputs, digital inputs, and relay outputs.
   b. The function of all analog inputs, analog outputs, digital inputs, and relay outputs.
   c. The ability to force all inputs and outputs to either a high, low, or specific value.

5. The drive shall automatically backup parameters to the control panel. The drive shall allow two additional unique manual backup parameter sets to be stored.

6. The control panel shall be removable, capable of remote mounting.

7. The drive shall be able to support a Bluetooth Advanced Control Panel. The Bluetooth control panel shall be FCC and QDL (Qualified Design Listing) certified.
   a. A free app (iOS and Android) shall replicate the control panel on a mobile device or tablet. The control panel's programming and control functionality shall function on the device. Customizing text, such as AHU-1 End Switch, shall be supported by the device's keyboard.
   b. Bluetooth connectivity shall allow uploading, downloading, and emailing of parameters.
   c. Bluetooth connectivity shall include two pairing modes: Always discoverable with a fixed passcode, and manual discovery with a unique generated passcode every pairing.

D. All drives shall have the following hardware features/characteristics as standard:

1. Two (2) programmable analog inputs, two (2) programmable analog outputs, six (6) programmable digital inputs, and three (3) programmable Form-C relay outputs.
2. The drive shall include an isolated USB port for interface between the drive and a laptop.

3. An auxiliary power supply rated at 24 VDC, 250 mA shall be included.

4. At a minimum, the drives shall have internal impedance equivalent to 5% to reduce the harmonics to the power line. 5% impedance may be from dual (positive and negative DC link) chokes, or AC line reactor. Drives with only one DC link choke shall add an AC line choke integral to the drive enclosure. Reference the drive schedule to determine if additional harmonic mitigation is required for the system to comply with IEEE 519-2014.

5. The drive shall have variable speed primary cooling fans.

6. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 135% overload for 2 seconds every minute.

7. The input current rating of the drive shall not be greater than the output current rating.

8. Circuit boards shall be coated per IEC 60721-3-3; Chemical gasses Class 3C2 and Solid particles Class 3S2.

9. Coordinated AC transient surge protection system consisting of 4 MOVs (phase-to-phase and phase-to-ground), a capacitor clamp, and internal chokes. The MOVs shall comply with UL 1449 4th Edition.

10. The drive shall include a robust DC bus to provide short term power-loss ride through. An inertia-based ride through function should help maintain the DC bus voltage during power loss events. Drives with control power ride through only, are not acceptable.

E. All drives shall have the following software features as standard:

1. A Fault Logger that stores the last 16 faults in non-volatile memory. The most recent 5 faults save at least 9 data points, including but not limited to: Time/date, frequency, DC bus voltage, motor current, DI status, temperature, and status words.

2. An Event Logger that stores the last 16 warnings or events that occurred, in non-volatile memory. Events shall include, but not limited to: Warning messages, checksum mismatch, run permissive open, start interlock open, automatic reset of a fault, power applied, auto start command, auto stop command, modulating started, and modulating stopped.

3. Programmable start method. Start method shall be selectable based on the application and function even if the motor was freewheeling in the reverse direction: Flying-start, Normal-start, and Brake-on-start.

4. Programmable loss-of-load (broken belt / coupling) indication. This function to include a programmable time delay to eliminate false loss-of-load indications.

5. Motor heating function to prevent condensation build up in the motor. Motor heating adjustment, via parameter, shall be in “Watts.”

6. There shall be a run permissive circuit for damper or valve control.
7. Four separate start interlock (safety) inputs shall be provided. The control panel will display the specific safety(s) that are open.

8. The drive shall include a switching frequency control circuit that reduces the switching frequency based on actual drive temperature. It shall be possible to set a minimum and a target switching frequency.

9. The ability to automatically restart after non-critical faults.

10. PID functionality shall be included in the drive.

11. Drive shall be compatible with an accessory that allows the control board to be powered from an external 24 VDC/VAC source.

12. A computer-based software tool shall be available to allow a laptop to program the drive. The drive shall be able to support programming without the need for line voltage. All necessary power shall be sourced via the laptop USB port.

13. The drive shall include a fireman's override mode.

F. Security Features

1. The drive manufacture shall clearly define cybersecurity capabilities for their products.

2. The drive shall include passcode protection against parameter changes. There shall be multiple levels of passcode protection including: End User, Service, Advanced, and Override.

3. A checksum feature shall be used to notify the owner of unauthorized parameter changes made to the drive.

4. The "Hand" and "Off" control panel buttons shall have the option to be individually disabled (via parameter) for drives mounted in public areas.

G. Network Communications

1. The drive shall have an EIA-485 port with removable terminal blocks. The onboard protocols shall be BACnet MS/TP, Modbus, and Johnson Controls N2. Optional communication cards for BACnet/IP and LonWorks shall be available.

2. The drive shall have the ability to communicate via two protocols at the same time, one onboard protocol and one option card based protocol.

3. The drive shall not require a power cycle after communication parameters have been updated.

4. The embedded BACnet connection shall be a MS/TP interface. The drive shall be BTL Listed to Revision 14 or later.

H. Disconnect – A circuit breaker or disconnect switch shall be provided when indicated on the drive schedule. The disconnect shall be door interlocked and padlockable. Drive input fusing shall be included on all packaged units that include a disconnecting means. All disconnect configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508A label.

I. Bypass – Bypass drive packages shall be provided when indicated on the drive schedule. All drive/bypass configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508A label.

1. The drive and bypass package shall be a complete factory wired and tested bypass system consisting of a padlockable disconnect device, drive output contactor, bypass contactor, and drive input fuses.

2. The bypass control shall be powered by a three-phase switch mode power supply with a voltage tolerance of +30%, -35%. Single-phase power supplies and control power transformers (CPT) are not acceptable.

3. The drive and bypass package shall be seismic certified and labeled to the IBC with a seismic importance factor of 1.5. Seismic certification shall include HCAI (formerly OSHPD) preapproval.

4. All bypass packages shall utilize a LCD bypass control panel (keypad) user interface. The bypass control panel must be a separate display from the drive control panel.

5. All bypasses shall have the following hardware features/characteristics as standard:
   a. Six (6) digital inputs and five (5) Form-C relay outputs.
   b. Drive isolation fuses shall be provided. Bypass designs which have no such fuses, or that only incorporate fuses common to both the drive and the bypass are not acceptable.
   c. The bypass shall be able to detect a single-phase input power condition while running in bypass, disengage the motor, and provide a single-phase input power indication.
   d. The bypass shall be designed for stand-alone operation and be completely functional in both Hand and Automatic modes, even if the drive and/or drive's control board has failed.

6. All bypasses shall have the following software features as standard:
   a. Programmable loss-of-load (broken belt / coupling) indication shall be functional in drive and bypass mode.
   b. Run permissive and start interlock control functionality shall be functional in bypass mode.
   c. The bypass control shall monitor the status of the drive and bypass contactors and indicate when there is a welded contactor contact or open contactor coil.
   d. The bypass shall include a selection for either manual or automatic transfer to bypass.
   e. The drive and bypass shall be designed to operate as an integrated system when in Override mode. There shall be four selectable Override modes: Bypass only, drive only, drive then transfer-to-bypass upon fault, and force to stop.

7. Network communications – the bypass shall include BACnet MS/TP, Modbus, and Johnson Controls N2 as standard. Optional communication cards for BACnet/IP and LonWorks shall be available.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive field-installed motors for compliance with requirements, installation tolerances and clearances from other equipment, access and other conditions affecting performance and maintenance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before motor installation.

C. Proceed with installation only after any and all unsatisfactory conditions have been corrected.

3.2 FIELD-INSTALLED MOTOR & CONTROLLER/VFD INSTALLATION

A. The responsible party shall install the drive in accordance with the drive's installation manual.

B. Installation shall be in accordance with national, state and local building and electrical codes.

C. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align with load transfer link.

D. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weatherproof covering. For extended outdoor storage, remove motors from equipment and store separately.

3.3 START-UP

A. Start-up shall be provided for each drive by an authorized local service provider.

3.4 PRODUCT SUPPORT

A. Factory trained support personnel shall be locally available at both the specifying and installation locations. A toll free 24/365 technical support line connected to factory support personnel located in the US and Canada shall be available.

B. Training shall include installation, programming and operation of the drive, bypass and network communications. Owner training shall be provided locally upon request.

3.5 WARRANTY

A. The drive Product Warranty shall be 30 months from the date of shipment from the factory. The warranty shall include: Parts, on-site labor, and travel time and travel costs, or replacement of the complete drive as determined by the drive manufacturer's technical support.

END OF SECTION

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 Hydronic Piping Systems:

    a. Constant-flow hydronic systems.
    b. Variable-flow hydronic systems.

2. Testing, Adjusting, and Balancing Equipment:

    a. Pumps/Motors.
    b. Boilers.
    c. Fan Coil Units.
    d. Energy Recovery Units.
    e. Water Source Heat Pumps.

3. Testing, adjusting, and balancing existing systems and equipment.

    a. All new HVAC systems shall be tested and balanced as part of this project. TAB specialist shall familiarize themselves with the existing systems and include balancing of all existing equipment in the area of work.

1.3 DEFINITIONS

A. BAS: Building automation systems.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

F. TDH: Total dynamic head.

1.4 PREINSTALLATION MEETINGS

A. TAB Conference: If requested by the Owner, conduct a TAB conference at Project site 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:

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 INFORMATIONAL 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. 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: Certified by AABC NEBB or TABB.

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/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.7 FIELD CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 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 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. Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. 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.

I. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

J. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

L. Examine system pumps to ensure absence of entrained air in the suction piping.

M. Examine operating safety interlocks and controls on HVAC equipment.

N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes 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. Hydronics:

a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
b. Piping is complete with terminals installed.
c. Water treatment is complete.
d. Systems are flushed, filled, and air purged.
e. Strainers are pulled and cleaned.
f. Control valves are functioning per the sequence of operation.
g. Shutoff and balance valves have been verified to be 100 percent open.
h. Pumps are started and proper rotation is verified.
i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.

j. Variable-frequency controllers' startup is complete and safeties are verified.
k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

B. Cut insulation, 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 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including valve position indicators 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.

3.4 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:

1. Check liquid level in expansion tank.
2. Check highest vent for adequate pressure.
3. Check flow-control valves for proper position.
4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
5. Verify that motor starters are equipped with properly sized thermal protection.
6. Check that air has been purged from the system.

3.5 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Adjust pumps to deliver total design gpm.

1. Measure total water flow.

a. Position valves for full flow through coils.
b. Measure flow by main flow meter, if installed.
c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

2. Measure pump TDH as follows:

a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.

c. Convert pressure to head and correct for differences in gage heights.
d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

B. Adjust flow-measuring devices installed in mains and branches to design water flows.

1. Measure flow in main and branch pipes.
2. Adjust main and branch balance valves for design flow.
3. Re-measure each main and branch after all have been adjusted.

C. Adjust flow-measuring devices installed at terminals for each space to design water flows.

1. Measure flow at terminals.
2. Adjust each terminal to design flow.
3. Re-measure each terminal after it is adjusted.
4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
5. Perform temperature tests after flows have been balanced.

D. For systems with pressure-independent valves at terminals:

1. Measure differential pressure and verify that it is within manufacturer's specified range.
2. Perform temperature tests after flows have been verified.

E. For systems without pressure-independent valves or flow-measuring devices at terminals:

1. Measure and balance coils by either coil pressure drop or temperature method.
2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

F. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
3. Mark final settings.

G. Verify that memory stops have been set.

3.6 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.

B. Adjust the variable-flow hydronic system as follows:

1. Verify that the differential-pressure sensor is located as indicated.
2. Determine whether there is diversity in the system.

C. For systems with no diversity:

1. Adjust pumps to deliver total design gpm.

    a. Measure total water flow.

        1) Position valves for full flow through coils.
        2) Measure flow by main flow meter, if installed.
        3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

    b. Measure pump TDH as follows:

        1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
        2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
        3) Convert pressure to head and correct for differences in gage heights.
        4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
        5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

    c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

2. Adjust flow-measuring devices installed in mains and branches to design water flows.

    a. Measure flow in main and branch pipes.
    b. Adjust main and branch balance valves for design flow.
    c. Re-measure each main and branch after all have been adjusted.

3. Adjust flow-measuring devices installed at terminals for each space to design water flows.

    a. Measure flow at terminals.
    b. Adjust each terminal to design flow.
    c. Re-measure each terminal after it is adjusted.
    d. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
    e. Perform temperature tests after flows have been balanced.

4. For systems with pressure-independent valves at terminals:

    a. Measure differential pressure and verify that it is within manufacturer's specified range.
    b. Perform temperature tests after flows have been verified.

5. For systems without pressure-independent valves or flow-measuring devices at terminals:

    a. Measure and balance coils by either coil pressure drop or temperature method.
    b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

6. Prior to verifying final system conditions, determine the system differential-pressure set point.
7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
8. Mark final settings and verify that all memory stops have been set.
9. Verify final system conditions as follows:

    a. Re-measure and confirm that total water flow is within design.
    b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
    c. Mark final settings.

10. Verify that memory stops have been set.

D. For systems with diversity:

1. Determine diversity factor.
2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
3. Adjust pumps to deliver total design gpm.

    a. Measure total water flow.

        1) Position valves for full flow through coils.
        2) Measure flow by main flow meter, if installed.
        3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

    b. Measure pump TDH as follows:

        1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
        2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
        3) Convert pressure to head and correct for differences in gage heights.
        4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
        5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

    c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

4. Adjust flow-measuring devices installed in mains and branches to design water flows.

    a. Measure flow in main and branch pipes.
    b. Adjust main and branch balance valves for design flow.
    c. Re-measure each main and branch after all have been adjusted.

5. Adjust flow-measuring devices installed at terminals for each space to design water flows.

    a. Measure flow at terminals.
    b. Adjust each terminal to design flow.
    c. Re-measure each terminal after it is adjusted.
    d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
    e. Perform temperature tests after flows have been balanced.

6. For systems with pressure-independent valves at terminals:

    a. Measure differential pressure, and verify that it is within manufacturer's specified range.
    b. Perform temperature tests after flows have been verified.

7. For systems without pressure-independent valves or flow-measuring devices at terminals:

    a. Measure and balance coils by either coil pressure drop or temperature method.
    b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.
9. Prior to verifying final system conditions, determine system differential-pressure set point.
10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
11. Mark final settings and verify that memory stops have been set.
12. Verify final system conditions as follows:

    a. Re-measure and confirm that total water flow is within design.
    b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
    c. Mark final settings.

13. Verify that memory stops have been set.

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 TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure motor voltage and amperage. Compare the values to motor nameplate information.
2. Check the refrigerant charge.
3. Check the condition of filters.
4. Check the condition of coils.
5. Check the operation of the drain pan and condensate-drain trap.
6. Check bearings and other lubricated parts for proper lubrication.
7. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
1. If calculations increase or decrease the water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.

3.9 TOLERANCES

A. Set HVAC system's water flow rates within the following tolerances:

1. Chilled-Water Flow Rate: Plus, or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.10 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents and installed conditions as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing

devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

3.11 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. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. 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.
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.

D. System Diagrams: Include schematic layouts of hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Water flow rates.
2. Duct, outlet, and inlet sizes.
3. Pipe and valve sizes and locations.
4. Terminal units.
5. Balancing stations.
6. Position of balancing devices.

E. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.
d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm.
g. Water pressure differential in feet of head or psig.
h. Required net positive suction head in feet of head or psig.
i. Pump rpm.
j. Impeller diameter in inches.
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig.
b. Pump shutoff pressure in feet of head or psig.
c. Actual impeller size in inches.
d. Full-open flow rate in gpm.
e. Full-open pressure in feet of head or psig.
f. Final discharge pressure in feet of head or psig.
g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

F. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.12 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Construction Manager and/or Commissioning authority.

B. Commissioning authority 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.

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.

3.13 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

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. Cellular glass.
   b. Flexible elastomeric.
   c. Mineral fiber.
2. Fire-rated insulation systems.
3. Insulating cements.
4. Adhesives.
5. Mastics.
6. Lagging adhesives.
7. Sealants.
8. Factory-applied jackets.
9. Tapes.
10. Securements.
11. Corner angles.
12. Acoustical Duct/Equipment Lagging

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings:

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, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application at linkages of control devices.
7. Detail field application for each equipment type.

C. Qualification Data: For qualified Installer.

D. 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.

1.4 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. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
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 size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork 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.

1.7 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. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cell-U-Foam Corporation; Ultra-CUF.
    b. Pittsburgh Corning Corporation; Foamglas Super K.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Board Insulation: ASTM C 552, Type IV.
5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
6. Preformed Pipe Insulation with Factory-Applied ASJ or ASJ-SSL: Comply with ASTM C 552, Type II, Class 2.
7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corp.; Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Duct Wrap.
    d. Owens Corning; All-Service Duct Wrap.

I. High-Temperature, Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type V, without factory-applied jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Johns Manville; HTB 23 Spin-Glas.
    b. Owens Corning; High Temperature Flexible Batt Insulations.

J. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corp.; Commercial Board.
    b. Johns Manville; 800 Series Spin-Glas.
    c. Knauf Insulation; Insulation Board.
    d. Owens Corning; Fiberglas 700 Series.

K. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Johns Manville; Micro-Lok.
    b. Knauf Insulation; 1000 Pipe Insulation.
    c. 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.
3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

L. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; CrimpWrap.
b. Johns Manville; MicroFlex.
c. Knauf Insulation; Pipe and Tank Insulation.
d. Owens Corning; Fiberglas Pipe and Tank Insulation.

M. Type A: Flexible glass fiber blanket; ANSI/ASTM C553; ‘k’ value of 0.23 at 75º F, 3.5 lb/cu feet density. Temperature range - 35º F to 250º F.

N. Type B: Rigid glass fiber board; ANSI/ASTM C612; ‘k’ value of 0.24 at 75º F, 6.0 lb/cu feet. Temperature range - 35º F to 250º F.

O. Type C: Molded cellular glass, chemically neutral ‘K’ valve of 0.38 and 50º minimum density – 8.0 lb/w. ft. Temperature range - 35ºF to 800ºF.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Insulco, Division of MFS, Inc.; Triple I.
b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. P. K. Insulation Mfg. Co., Inc.; Thermal-V-Kote.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Insulco, Division of MFS, Inc.; SmoothKote.
b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
c. Rock Wool Manufacturing Company; Delta One Shot.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-97.
b. Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA Inc.; Aeroseal.
b. Foster Products Corporation, H. B. Fuller Company; 85-75.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Chemical Company (The); 739, Dow Silicone.
b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.

2. Water-Vapor Permeance: ASTM E 96, 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, 59 percent by volume and 71 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-52.
b. Foster Products Corporation, H. B. Fuller Company; 81-42.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F.
4. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-76-8.
b. Foster Products Corporation, H. B. Fuller Company; 95-44.

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.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.8 FIELD-APPLIED JACKETS

A. Metal Jacket:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; Metal Jacketing Systems.
b. PABCO Metals Corporation; Surefit.
c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

a. Factory cut and rolled to size.
b. Finish and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper3-mil- thick, heat-bonded polyethylene and kraft paper2.5-mil-thick Polysurlyn.
d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
e. Factory-Fabricated Fitting Covers:
    1) Same material, finish, and thickness as jacket.
    2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    3) Tee covers.
    4) Flange and union covers.
    5) End caps.
    6) Beveled collars.
    7) Valve covers.
    8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

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, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pittsburgh Corning Corporation; Pittwrap.
b. Polyguard; Insulrap No Torch 125.

2.9 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, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
b. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
c. 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.

2.10 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products; Bands.
b. PABCO Metals Corporation; Bands.
c. RPR Products, Inc.; Bands.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch diameter shank, length to suit depth of insulation indicated.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
        1) AGM Industries, Inc.; CWP-1.
        2) GEMCO; CD.
        3) Midwest Fasteners, Inc.; CD.
        4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
        1) AGM Industries, Inc.; CWP-1.
        2) GEMCO; Cupped Head Weld Pin.
        3) Midwest Fasteners, Inc.; Cupped Head.
        4) Nelson Stud Welding; CHP.

3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
        1) AGM Industries, Inc.; RC-150.
        2) GEMCO; R-150.
        3) Midwest Fasteners, Inc.; WA-150.
        4) Nelson Stud Welding; Speed Clips.

    b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch wide, stainless steel or Monel.

D. Wire: 0.080-inch nickel-copper alloy.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. C & F Wire.
    b. Childers Products.
    c. PABCO Metals Corporation.
    d. RPR Products, Inc.

2.11 CORNER ANGLES

A. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

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.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. 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 equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and 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. Insulate all pumps with type C insulation. Fabricate custom aluminum sheet metal enclosure around pump body and fittings. Cut and fit insulation to tightly fit the size and shape of the pump body parts including the volute and inlet and outlet piping and fittings. The enclosure shall be removable without cutting or breaking the insulation. The enclosure shall be vapor tight to prevent condensation and fastened to the pump base.

Q. 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. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. 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 below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at 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.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping"irestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

A. Mineral Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:

    a. Do not weld anchor pins to ASME-labeled pressure vessels.
    b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
    c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
    d. Do not over compress insulation during installation.
    e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
    f. Impale insulation over anchor pins and attach speed washers.

    g. 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.
5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut

with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.

7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.

1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
2. Seal longitudinal seams and end joints.

C. Insulation Installation on Pumps:

1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism.
2. Fabricate boxes from galvanized steel, at least 0.040 inch thick.
3. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

3.6 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, vessels, and equipment. 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.

3.7 CELLULAR-GLASS INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.8 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.10 FIELD-APPLIED JACKET INSTALLATION

A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.11 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

3.12 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 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 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.

3. 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 threeInsert number 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.

3.13 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

C. Chilled water, condenser water, and hot water pump insulation shall be the following:

1. Flexible Elastomeric: 2 inch thick.

D. Chilled water, condenser water, and hot water air-separator and expansion tank insulation shall be the following:

1. Glass Fiber: 2-inch-thick and 3-lb/cu. ft. nominal density.

E. All Specialties valves insulation shall be of the following:

1. Type C: 2 inch thick.

F. All fittings insulation shall be of the following:

1. Type C: 2 inch thick

G. Chiller Evaporator insulation shall be the following:

1. Flexible Elastomeric: 1-1/2 inch thick.

3.14 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.

2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.15 INDOOR AND OUTDOOR PIPING INSULATION SCHEDULE

A. Chilled Water Supply and Return, 40 to 60 Deg F service temperature:

1. NPS 1-1/2" and Smaller: Insulation shall be the following:
   a. Glass-Fiber, Preformed Pipe, Type I: 1 inch thick and 3.5-lb/cu. ft. nominal density

2. NPS 1-1/2" to 8":
   a. Glass-Fiber, Preformed Pipe, Type I: 2 inches thick and 3.5-lb/cu. ft. nominal density

B. Heating-Hot-Water Supply and Return, 200 Deg F and below:

1. NPS 1.25" and less:
   a. Glass-Fiber, Preformed Pipe, Type I: 1.5 inches thick and 3.5-lb/cu. ft. nominal density

2. NPS 1.5" to 8":
   a. Glass-Fiber, Preformed Pipe, Type I: 2 inches thick and 3.5-lb/cu. ft. nominal density

3.16 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. All Outdoor Piping and Fittings: Aluminum Jacket, smooth, 0.02 inch thick. (see Sections 2.8 and 3.10)

END OF SECTION

SECTION 230800
COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.

B. Related Sections:

1. 019113 – General Commissioning Requirements

2. Division 23 Sections

1.3 SCOPE

A. Commissioning requires the participation of Division 23, Mechanical Contractor and Subcontractors, to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 019113. Division 23, Mechanical Contractor and Subcontractors shall be familiar with Section 019113 and the Commissioning Plan issued by the Commissioning Agent (CA) and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.4 SYSTEMS TO BE COMMISSIONED

A. The following Mechanical systems will be commissioned on this project:
1. Hydronic System: includes all of the following equipment: Air-cooled chiller, condensing hot water boilers, hot water pumps, chilled water pumps, radiant heat panels, convectors, hydronic control valves, hydronic balancing valves and hydronic balancing.
2. Airside Systems: Roof Top Units, variable air volume boxes, exhaust fans and airside balancing
3. All Direct Digital Controls (DDC) shall be verified for proper operation as it relates to the above equipment including interfaces for remote monitoring.

1.5 RESPONSIBILITIES

A. Commissioning responsibilities applicable to the Mechanical contractor of Division 23 are as described in Section 019113, Paragraph 1.10-I.

1.6 OPERATION AND MAINTENANCE (O&M) MANUALS

A. Compile and prepare documentation for all equipment and systems covered in Division 23, Mechanical, and deliver to Construction Manager for inclusion in O&M Manuals in accordance with Division 1.

B. Provide the Commissioning Agent with a copy of O&M Manuals for review.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Provide test equipment necessary to fulfill testing requirements of Division 23, Mechanical.

B. Refer to Section 019113 and other Division 23 Sections for additional Division 23, Mechanical requirements.

PART 3 - EXECUTION

3.1 PREFUNCTIONAL CHECKLISTS AND STARTUP

A. Prefunctional tests and checklists (PFT's) are important to ensure that the equipment and systems are connected properly and are operational. PFT's ensure that functional performance testing may proceed without unnecessary delays. The Contractor shall be responsible for performing Prefunctional testing. EVERY piece of equipment receives a full Prefunctional checkout.

B. Division 23, Mechanical, has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting design objectives of Contract Documents. Commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to CA or Owner.

3.2 FUNCTIONAL PERFORMANCE TESTS

A. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to completion of systems or sub-systems at discretion of CA and CM. Beginning system testing before full completion does not relieve Contractor from fully completing system as soon as possible, including prefunctional checklists.

B. Functional performance testing requirements are in addition to and do not replace any testing required by Code or listed elsewhere in Division 23.

C. Functional performance testing procedures will be performed on but not be limited to the following system types and equipment. Final functional testing requirements and procedures will be developed based on approved equipment shop drawings.

1. HVAC System
    a. Equipment:
        1) Air- Cooled Chiller
        2) Chilled Water / Hot Water Pumps

3) Hot Water Condensing Boilers
4) Roof Top Units
5) Variable Air Volume Boxes
6) Radiant Heat Panels
7) Convectors
8) Exhaust Fans
9) Control panel and components

2. Building Management System
   a. Equipment:
      1) Field control panels
      2) Operator workstations
      3) File server(s)
      4) Verification of controls front end.

3.3 ISSUES AND DEFICIENCIES

A. Refer to Section 019113 for details relating to resolution of issues and deficiencies.

3.4 TRAINING OF OWNER PERSONNEL

A. Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed. Refer to Section 019113 for details.

B. Duration of Training: Mechanical Contractor shall provide training on each piece of equipment according to the following schedule:

System	**Minimum Training Hours**
Air- Cooled Chiller	1
Hot Water Condensing Boiler	1
HVAC Water Treatment	1
Hydronic System, Pumping, Distribution & Controls	1
Roof Top Units	1
Terminal Air and Hydronic Units	1
BMS DDC Controls – General	1
Total Training Time	**7 Hours**

END OF SECTION

SECTION 230900
INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including any applicable General and Supplementary Conditions and any Division 01 Specification Sections, apply to this Section.

B. Related Sections include the following:
   1. Division 23 Section "Sequence of Operations for HVAC Controls" for requirements that relate to this Section.

1.2 DEFINITIONS

A. BAS: Building Automation System

B. BMS: Building Management System

C. I/O: Input/output.

D. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.

E. MS/TP: Master slave/token passing.

F. PC: Personal computer.

G. PID: Proportional plus integral plus derivative.

H. RTD: Resistance temperature detector.

1.3 SUMMARY

A. Work Included:

   1. Furnish and install a control system and associated instruments as required by the sequence of operation and associated drawings.

   2. The Mechanical Contractor shall be the prime contractor for this project. All other contractors shall be sub-contractors (electrical, plumbing, etc.) as determined by the contractor. Provide a complete functional Building Automation System in all respects.

   3. Provide all power wiring required by the Building Automation System scope.

   4. Provide testing and balancing services as required to accomplish the intended sequence of operations and calibrate and verify all flow sensors and instruments.

5. Contractor to field verify all existing conditions prior to the beginning of work and coordinate new work.

6. Visit site before submitting bid. Inspect and verify all conditions, which may affect cost of installation. Verify exact location of all existing pipes, ducts, beams, etc., whether shown on the drawings or not, so far as these locations relate to the new work.

B. System Description

1. General Requirements

a. The Control System shall be an on-line network of distributed, communicating micro-processor based stand-alone controllers, and shall include an internet **web-based operator workstation interfaces** and programming software applications, field sensors, control devices, enclosures and interconnecting conduit and wire.

b. The Control System shall be a product of one of the following Acceptable System Manufactures:
   1) Schneider Electric - EcoStruxure
   2) Johnson Controls
   3) Automated Logic
   4) Reliable Controls

c. The networked components of the system shall make up a BACnet internetwork including at least a high speed and/or other LAN's interconnecting BACnet devices. Those devices on the BACnet internetwork shall communicate utilizing the BACnet protocol on BACnet LAN types.

d. Actuation of control devices shall be electronic. Spring return fail-safe actuation shall be provided when loss of property is possible without spring return fail-safe.

2. Web-Based Operator Workstations: The BAS system supplier shall furnish licenses for web connection to the BAS system. Web-based users shall have access to all system points and graphics, shall be able to receive and acknowledge alarms, and shall be able to control setpoints and other parameters. All engineering work, such as trends, reports, graphics, etc. that are accomplished from the WorkStation shall be available for viewing through the web browser interface without additional changes. The web-based interface must conform to the B-OWS BACnet device profile. There will be no need for any additional computer based hardware to support the web-based user interface

3. Basic System Architecture

a. The system components shall include but not be limited to:

   1) Operator Workstation with operating software (B-OWS)

   2) Third Party Application Software

   3) Building Controllers (B-BC)

   4) Advanced Application Controllers (B-AAC)

5) Application Specific Controllers (B-ASC)

6) Enclosures

7) Field Sensors

8) Controlled Devices

9) Interconnecting Wire & Cabling

10) Service Tools

11) Network LAN's & Communication Protocols

12) Interfaces for Hardwire Connection to Variable Frequency Controls

13) Serial interface to other system listed below:

b. Field Sensors and Control Devices shall connect to peer-to-peer, fully programmable B-BC, B-AAC & B-ASC as required to achieve the point monitoring and control sequences specified. All devices are to be monitored by B-OWS. Controlled devices are to be electronically actuated. Each mechanical system shall have a controller that shall be connected to all field sensors and control devices for that system. Sensors and Control devices shall be UL listed.

1.4 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphics shall display with a minimum of 50 dynamic current data points and within 10 seconds of the request.

2. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 10 seconds. Analog objects shall start to adjust within 10 seconds of being commanded to change.

3. All changes of state or change of analog values shall be transmitted such that no reporting of a value is more than 15 seconds old.

4. The maximum time from when an object goes into alarm to when it is annunciated at the B-OWS shall not exceed 20 seconds. Those points denoted as critical shall be annunciated within 2 seconds.

5. B-BC, B-AAC, & B-ASC shall be able to execute control loops at a selectable frequency at least five times every second. The controller shall scan and update the process value and output generated by this calculation at this same frequency.

6. All B-OWS on the network shall receive alarms within 5 seconds of each other.

a. Each controller/sensor combination shall be selected and designed to perform within the accuracy and repeatability limits specified herein.

b. Unless noted otherwise in these Specifications the overall combined system accuracy of sensors, controllers and readout devices shall be noted in Table 1.

Table 1 – System Accuracy	
Measured Variable	Reported Accuracy
Water temperature	+/-0.5 deg. C (+/-1 deg. F)
Delta-T	+/-0.15 deg. C (+/-0.25 deg. F)
Water flow	+/-2% of actual valve
Water pressure	+/-1PSI (Note 2)

c. Overall combined system repeatability of sensors, controllers and readout devices for a particular application shall be plus or minus 2 percent of full scale of the operating range. Repeatability of overall combined system of sensor, controller and readout device in a control loop application will be plus or minus 5 percent of full scale of the operating range.

d. Long-term electronic drift shall not exceed 0.4 percent per year.

7. The system to have an ultimate capacity of at least 20,000 to 30,000 points.

8. All components provided as part of this system shall operate under indoor ambient environmental conditions of 35°F to 122°F dry bulb and 10 percent to 95 percent relative humidity, non-condensing as a minimum. Outdoor conditions shall be -30°F to 150°F and 0 percent to 100 percent relative humidity. Sensors and control elements shall operate under the ambient environmental temperature, pressure, humidity, and vibration conditions encountered for the installed location. B-OWS equipment, such as CRTs and printers, shall, unless designated otherwise, operate properly under ambient environmental conditions of 45°F to 90°F and a relative humidity of 10 percent to 90 percent.

9. Networked components of the system shall be able to operate at 90-percent to 110-percent of nominal voltage rating and shall perform an orderly shutdown below 80-percent.

10. All sensors and control devices exposed directly to a controlled media shall be rated to withstand 150 percent of maximum conditions found where in contact with the controlled media, and shall be constructed of material suitable for the media sensed.

1.5 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.

3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

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. Bill of materials of equipment indicating quantity, manufacturer, and model number.
2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
3. Wiring Diagrams: Power, signal, and control wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequence of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
7. Schedule of valves including flow characteristics.
8. System Hardware:

    a. Wiring diagrams for control units with termination numbers.
    b. Schematic diagrams and floor plans for field sensors and control hardware.
    c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.

9. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.
10. Controlled Systems:

    a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
    b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
    c. Written description of sequence of operation including schematic diagram.
    d. Points list.

C. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.
5. Software license required by and installed for workstations and control systems.

D. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

E. Qualification Data: For Installer and manufacturer.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For HVAC instrumentation and control system 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 instructions and lists of spare parts for each type of control device.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

B. System Contractor shall be a licensed contractor specializing and experienced in control system installations for not less than 5 years and with experience in networked microprocessor based commercial HVAC and Electrical control systems installation with point counts equal to this project.

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. To the extent practical, all equipment of the same type serving the same function shall be identical and from the same manufacturer.

1.7 WARRANTY, MAINTENANCE, NORMAL AND EMERGENCY SERVICE

A. The Contractor shall warranty the Control System to be free from defects in workmanship and material under normal expected service and use for a period of one (1) year from date of final acceptance by the Owner. During this period, the Contractor shall furnish all labor to repair or replace all items or components that fail due to defects in workmanship or material at no charge or reduction in service to the owner. Provide this service within 4 hours of notice from the Owner’s representative.

B. Manufacturer shall provide a five-year warranty for all B-BC, B-AAC and B-ASC controllers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

Acceptable System Manufacturers:
Schneider – Andover Continuum
Honeywell – Webs

2.2 BUILDING CONTROLLERS (B-BC)

A. Hardware and Operating System

1. Provide B-BC as required to meet the topology and performance requirements of the project. "Refer to Sequence of Operations" for detailed performance requirements.

2. Each B-BC shall have an on-board power switch.

3. B-BC shall provide battery-backed distributed processing and shall communicate with all B-AAC's and B-ASC's on a peer-to-peer basis.

4. B-BC shall be capable of deciding global strategies for the system based on information from any objects in the system. Control Systems that require a higher-level host processor for update, time stamps, global point data, COS transfer, on-line control instruction, or communications control between B-BC panels shall not be acceptable.

5. B-BC shall be capable of either discriminating or indiscriminately sharing global data with other B-BC and B-OWS on the BACnet internetwork.

6. Input/Output Configuration

   a. All inputs shall be universal and configured in hardware or software. Inputs shall accept dry-contact, 4-20mA, thermistor and 0-5VDC sources. Pulse accumulation points shall accommodate a minimum frequency of 20Hz. Analogue to digital-to-digital conversion shall be 12 bit resolution.

   b. All outputs shall be universal and configured as analogue or digital in hardware or software. Outputs shall provide modulating signal to industry standard 4-20 mA, 0-5v and 0-10v analog control devices and control relays. All outputs shall be capable of sourcing at least 50mA of current simultaneously. Digital to analog conversion shall be a minimum of 12-bit resolution. All outputs shall have physical hand-off-auto switched located within the control enclosure. H-O-A switch shall be hardware monitored by the B-BC for switch position.

7. B-BCs shall have sufficient memory to support its operating system, database, and programming requirements. Battery shall retain static RAM memory and clock functions for a minimum of 72 hours. B-BC operating system, field database, and application programs shall reside in on-board memory or EEPROM.

8. Provide diagnostic LEDs for power, communications and processor. The B-BC shall continually check the status of its processor and memory circuits.

B. Control System Application Software

1. Database definition shall be accomplished through the B-OWS online with the B-BC. The complete database and application program shall reside in the B-BC. The System Contractor shall configure the software to attain the proper sequence of control and to accomplish all other control system functions indicated in the Contract Documents. The user shall be able to add, delete, or modify objects on-line as required.

   The programming shall provide all the necessary mathematics, logic, utility and control functions necessary for proper sequence of control.

2. The software defined within the B-BC, in conjunction with the stand-alone control loops residing within the B-AAC & B-ASC shall provide all required application programming.

3. Alarm management shall be provided. Each B-BC panel shall perform distributed, independent alarm analysis and filtering. At no time shall the B-BC panel's ability to report alarms be affected by either operator activity at a B-OWS or local I/O device, or communications with other B-BC on the network.

    a. B-BCs shall have capability to call out alarm conditions automatically. Alarm message and site description shall be sent to off-site computer or serial printer. If desired, controller may also send encoded message to digital pager.

    b. Alarms log shall be viewable on site or remotely shall be provided.

    c. All alarm or point change reports shall include the point's English language description, and the time and date of occurrence.

    d. The user shall be able to define the specific system reaction for each point alarm and shall be able to customize reaction and filtering to minimize nuisance reporting. Each B-BC panel shall automatically inhibit the reporting of selected alarms during the standby power modes of operation, loss of power, fire alarm mode, and normal system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.

    e. Alarm reports, messages, and files can be directed to a user-defined list of operator devices, or PCs used for archiving alarm information.

4. A variety of historical data collection utilities shall be provided. Minimum sampling time shall be programmable with a minimum programmable time of one second.

    a. B-BC panels shall store point history files for all analog and binary inputs and outputs.

    b. Measure and calculated analog and binary data shall also be assignable to user-definable trends.

    c. Trend data shall be stored at the stand-alone B-BC panels, and uploaded to hard disk storage when archival is desired. Separate archival application software will be accepted.

5. Stand-alone B-BC panels shall automatically accumulate and store runtime hours for binary input and output points.

6. B-BC panels shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.

7. B-BC panels shall have the ability to count events on a daily, weekly, or monthly basis.

8. Demand Limiting

    a. System shall be capable to monitor energy demand from any type of energy source. Networked B-BC shall provide a demand-limiting routine that shall shed appropriate system objects to prevent the demand from exceeding preset limits.

    b. Zone shed method shall be by either preventing zone heating or cooling operations, or by shifting zone heating and cooling set points.

2.3 ADVANCED APPLICATION CONTROLLER (B-AAC)

A. Hardware & Operating System

1. Each B-AAC shall have an on-board power switch. If the device manufacturer provides no on-board switch, then the System Contractor shall provide a separate dedicated transformer and switch within each enclosure for each controller present.
2. Each B-AAC operating system shall reside in FLASH EEPROM.
3. Each B-AAC to be expandable by adding Input/Output logic modules or Input/Output expansion modules.
4. The primary device for input/output connection to the field sensors, and control devices shall be a B-AAC. Each B-AAC shall acquire, process and store point input data on a real time basis for internal use and for sharing with other controllers. Each B-AAC shall also maintain and supervise digital and analog output signals to the control devices and have a real time operating system capable of time-of-day scheduling and other time based functions.
5. B-AAC shall provide microprocessor based self-contained stand-alone fully programmable operation of local process control loops. All local level application programs shall be installed on individual controllers in non-volatile memory. Each B-AAC shall be capable of sharing point information with other B-BC, B-AAC, or B-ASC on the BACnet internetwork.
6. Control systems that require communication between B-AAC or B-ASC and a B-OWS or B-BC for normal control functions, or which operate in a degraded mode without those level communications, or which require programmable read only memory (PROM) level application programming are not acceptable.
7. Once downloaded, a B-AAC shall not require further communication with the B-OWS except for data base changes, operator commands, and requests from the B-OWS for B-AAC data. Programming of B-AACs shall be completely modifiable in the field, over installed BACnet Internetwork or remotely via modem.
8. All wiring shall be connected to padded screw terminals.
9. Input/Output Configuration
    a. All inputs shall be universal and configured in hardware or software. Inputs shall accept dry-contact, 4-20mA, thermistor and 0-5VDC sources. Pulse accumulation points shall accommodate a minimum frequency of 20Hz. Analogue to digital-to-digital conversion shall be 8 bit resolution.
    b. All outputs shall be universal and configured as analogue or digital in hardware or software. Outputs shall provide modulating signal to industry standard 4-20 mA, 0-5v and 0-10v analog control devices and control relays. All outputs shall be capable of sourcing at least 50mA of current simultaneously. Digital to analog conversion shall be a minimum of 10-bit resolution. All outputs shall have physical hand-off-auto switched located within the B-AAC control enclosure. H-O-A switch shall be hardware monitored by the B-AAC for switch position.
10. Provide diagnostic LEDs for power, communications and processor.
11. Each B-AAC shall be provided with the ability to prevent unauthorized access to its software program.
12. Each controller shall be addressable.
13. The B-AAC shall meet BACnet profile for Advanced Application Controller.

B. Control System Application Software:

1. The B-AAC application software shall be the same as and indistinguishable from the B-BC application software.

2. The controller software shall reside in a real time, multi-tasking, networking operating environment. Database definition shall be accomplished through the B-OWS online with the B-AAC. The complete database and application program shall reside in the B-BC. The System Contractor shall configure the software to attain the proper sequence of control and to accomplish all other control system functions indicated in the Contract Documents. The user shall be able to add, delete, or objects on-line as required. The programming shall provide all the necessary mathematics, logic, utility and control functions necessary for proper sequence of control.

2.4 APPLICATION SPECIFIC CONTROLLER (B-ASC)

A. Hardware
1. Dedicated B-ASC for Individual Fans and terminal equipment may be provided at the discretion of the System Contractor.
2. B-ASC hardware shall be the same as B-AAC and indistinguishable with the exception that there is no requirement to have expansion I/O modules an on-board power switch or H-O-A overrides on outputs and the communication capabilities are different as described below.

B. Control System Application Software
1. Shall be the same as B-BC.

2.5 CONTROL ENCLOSURES & SUB-PANELS

A. Provide wall mounted local control enclosures to house all control components associated with each area, system or mechanical equipment room. The enclosures shall be minimum 16 gage steel or aluminum bonded on both sides to a plywood core, totally enclosed on all sides and painted with a baked enamel finish. Provide a continuous piano-hinged door, keyed locking latch and removable sub-panel. A single key shall be common to all control enclosures. Enclosures shall be the same NEMA classification as all other enclosures located in the same environment, except if location requires additional protection due to potential vandalism or environmental conditions. At a minimum enclosures located in dry indoor conditions shall conform to NEMA 1 standards. Enclosures located in wet indoor conditions such as garages or located outdoors shall be fully gasketed and shall conform to NEMA 4X standards, and enclosures located outside for cooling tower condenser water controls shall be constructed of stainless steel.

B. Where approved by the Owner/Engineer, existing control enclosures may be reused by the System Contractor as part of renovation projects.

C. Provide laminated nameplates for all control system components. Nameplates shall be 1/8 inch (.32cm) thick, black, with white-center core, and shall be minimum 1 inch by 3 inches [2.5 cm X 7.5 cm], with minimum ¼ inch high block lettering. Nameplates for devices smaller than 1 inch by 3 inches [2.5 cm X 7.5 cm] shall be attached to adjacent surface.

D. Provide each panel with a surge suppressor, electrical disconnect, control fuse, and control transformer. All sized and provided by the control system contractor.

E. All new control enclosures shall be located in concealed areas. Obtain prior approval from owner for all proposed enclosure locations.

2.6 GENERAL FIELD DEVICES

A. All control relays shall be UL listed plug-in type with dust cover and with contacts and coils rated for the application.
   1. Relays used for in-line control start/stop of line voltage motors and shall have a current rating at least 1.5 times full load amps.

B. Control transformers shall be CSA and US listed. Primary and secondary sides shall be fused in accordance with the NEC or shall be class 2 current limiting type.

C. Emergency shut-off switches shall be heavy duty, two-position push-pull, maintained contact, illuminated 1-3/8 inch in diameter mushroom style push button switch. Provide hinged easy open protective clear cover to prevent accidental operation of switch.

2.7 CONTROL WIRE AND CABLE

A. Wire: Single conductor control wiring above 24 V.

   1. Wire size shall be at least No. 18 AWG.
   2. Conductor shall be 7/24 soft annealed copper strand with 2- to 2.5-inch lay.
   3. Conductor insulation shall be 600 V, Type THWN or Type THHN, and 90 deg C according to UL 83.
   4. Conductor colors shall be black (hot), white (neutral), and green (ground).

B. Single Twisted Shielded Instrumentation Cable above 24 V:

   1. Wire size shall be a minimum No. 18 AWG.
   2. Conductors shall be a twisted, 7/24 soft annealed copper strand with a 2- to 2.5-inch lay.
   3. Conductor insulation shall have a Type THHN/THWN or Type TFN rating.
   4. Shielding shall be 100 percent type, 0.35/0.5-mil aluminum/Mylar tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
   5. Outer jacket insulation shall have a 600-V, 90-deg C rating and shall be Type TC cable.
   6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.

C. Single Twisted Shielded Instrumentation Cable 24 V and Less:

   1. Wire size shall be a minimum No. 22 AWG.
   2. Conductors shall be a twisted, 7/24 soft annealed copper stranding with a 2- to 2.5-inch lay.
   3. Conductor insulation shall have a nominal 15-mil thickness, constructed from flame-retardant PVC.

4. Shielding shall be 100 percent type, 1.35-mil aluminum/polymer tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 300-V, 105-deg C rating and shall be Type PLTC cable.
6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.

D. LAN and Communication Cable: Comply with system manufacturer requirements for network being installed.

1. Cable shall be plenum rated.
2. Cable shall comply with NFPA 70.
3. Cable shall have a unique color that is different from other cables used on Project.
4. Copper Cable for Ethernet Network:

    a. 100BASE-TX, 1000BASE-T or 1000BASE-TX.
    b. TIA/EIA 586, Category 5e or Category 6.
    c. Minimum No. 24 AWG solid.
    d. Shielded Twisted Pair (STP).
    e. Thermoplastic insulated conductors, enclosed in a thermoplastic outer jacket, Class CMP as plenum rated.

2.8 RACEWAYS FOR CONTROL WIRING, CABLING, AND TUBING

A. Metal Conduits, Tubing, and Fittings:
1. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. EMT: Comply with NEMA ANSI C80.3 and UL 797.
3. FMC: Comply with UL 1; zinc-coated steel or aluminum.
4. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
5. Fittings for Metal Conduit: Comply with NEMA ANSI FB 1 and UL 514B.

    a. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
    b. Fittings for EMT:

        1) Material: Steel or die cast.
        2) Type: Setscrew or compression.

    c. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
    d. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

B. Nonmetallic Conduits, Tubing, and Fittings:

1. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. ENT: Comply with NEMA TC 13 and UL 1653.
3. LFNC: Comply with UL 1660.
4. Rigid HDPE: Comply with UL 651A.
5. Continuous HDPE: Comply with UL 651A.
6. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
7. RTRC: Comply with UL 2515A and NEMA TC 14.
8. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
9. Fittings for LFNC: Comply with UL 514B.

C. Metal Wireways and Auxiliary Gutters:
1. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

a. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
3. Wireway Covers: Screw-cover type unless otherwise indicated.
4. Finish: Manufacturer's standard enamel finish.

D. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Prime coated, ready for field painting.

2.9 CONTROL POWER WIRING AND RACEWAYS

A. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" electrical power conductors and cables.

B. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

2.10 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant, for wall, immersion, or duct mounting as required.

B. Thermistor Temperature Sensors and Transmitters:

1. Available Manufacturers:

a. BEC Controls Corporation.
b. Dwyer Instruments

c. Ebtron, Inc.
d. Honeywell, Inc.
e. I.T.M. Instruments Inc.
f. MAMAC Systems, Inc.
g. RDF Corporation.

2. Accuracy: Plus, or minus 0.5°F at calibration point.
3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
5. Averaging Elements in Ducts: 18 inches long, rigid, use where prone to temperature stratification or where ducts are larger than 10 sq. ft.
6. Insertion Elements for Liquids: Brass or stainless steel socket with minimum insertion length of 2-1/2 inches.
7. Space temperature sensor shall consist of an element within a ventilated cover. Sensors located in plenums, lobbies, or other public spaces shall be simple sensor with no setpoint adjustment.
8. Terminal Unit space temperature sensor shall be as described in 2.13 A 6 with the requirement that all options are provided. All sensors not located in public spaces and associated with B-ASC or B-AAC that is located in normally inaccessible locations shall be the same. Sensor's accuracy shall be unaffected by wiring up to 250'
9. Room Sensor Cover Construction: Manufacturers standard locking covers.
   a. Thermometer: Concealed.
   b. Color: TBD
10. Outside air temperature sensor shall consist of a single device sensor, ventilated non-metallic sun shield, utility box for terminations, and watertight gasket to prevent water seepage.
11. Wet Bulb temperature and humidity station shall be suitable for duct or outside mounting and consist of sensors, ventilated non-metallic sun shield, utility box for terminations, and watertight gasket to prevent water seepage

C. RTDs and Transmitters:

1. Available Manufacturers:

   a. BEC Controls Corporation.
   b. Dwyer Instruments
   c. Honeywell, Inc.
   d. MAMAC Systems, Inc.
   e. RDF Corporation.

2. Accuracy: Plus, or minus 0.2 percent at calibration point.
3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
5. Averaging Elements in Ducts: 18 inches long, rigid; use where prone to temperature stratification or where ducts are larger than 9 sq. ft. length as required.
6. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.

D. Pressure Transmitters/Transducers:

1. Available Manufacturers:

    a. BEC Controls Corporation.
    b. Dwyer Instruments
    c. General Eastern Instruments.
    d. Honeywell, Inc.
    e. MAMAC Systems, Inc.
    f. ROTRONIC Instrument Corp.
    g. TCS/Basys Controls.
    h. Vaisala.

2. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.

    a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
    b. Output: 4 to 20 mA or linear voltage signal
    c. Building Static-Pressure Range: 0- to 0.25-inch wg.
    d. Duct Static-Pressure Range: 0- to 5-inch wg.

3. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure; linear output 4 to 20 mA.
4. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.
5. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
6. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA or suitable voltage signal

2.11 STATUS SENSORS

A. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig, piped across pump.

B. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

C. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

D. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

E. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

1. Available Manufacturers:

a. BEC Controls Corporation.
b. Dwyer Instruments
c. Honeywell, Inc.
d. I.T.M. Instruments Inc.

2.12 CONTROL VALVES

A. Available Manufacturers:
1. Belimo
2. Erie Controls
3. Honeywell, Inc.
4. Siemens
5. Johnson Controls Inc.

B. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

C. Hydronic system globe valves shall have the following characteristics:

1. NPS 2 and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with back-seating capacity re-packable under pressure.
2. NPS 2-1/2 and Larger: Class 125 iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.
3. Internal Construction: Replaceable plugs and stainless steel or brass seats.

a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.
b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.

4. Sizing: 3-psig maximum pressure drop at design flow rate or the following:

a. Two Position: Line size.
b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more.
c. Three-Way Modulating: Twice the load pressure drop, but not more than value specified above.

5. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
6. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system (pump) head for two-way valves and 100 percent of pressure differential across valve or 100 percent of total system (pump) head.

2.13 WATER LEVEL SENSORS

A. Available Manufacturers:
1. Global Water, WL400

B. Sensing Element:
1. Description: submersible pressure transducer consisting of solid-state pressure sensor encapsulated in a stainless steel housing.
2. Sensor Element: Silicone Diaphragm, Wet/Wet transducer
3. Range: (per application) 0 – 250 ft.
4. Linearity:±0.1% FS
5. Accuracy: :±0.1% FS
6. Overpressure: not to exceed 2xfull scale range
7. Output: 4-20mA
8. Supply Voltage: 10-36VDC
9. Operating temperature: -40°F to 185°F
10. Compensated temperature range: 30°F to 70°F, with automatic barometric compensation

C. Construction:
1. Housing: 304L SS
2. Cable : 4 conductors, 22AWG each
3. Cable Jacket: FEP Teflon
4. 300 volt insulation
5. Vent tube: HD Polyurethane

D. Options:
1. Water level range to 250 ft.
2. Provide cable to suit job conditions, up to 500 ft.
3. Cable insulation must be greater than or equal to the insulation rating of the cables in the same conduit.
4. Electrical contractor to pull existing power wiring out of the existing 1 ½ inch conduits (one for each of the five well pumps), install new water sensor cable and reinstall new power cable with sensor cable. Contractor to installing a 4-conductor number 16 gauge shielded Teflon jacked cable from the mechanical room control panel to a junction box at the top of each well and connect the 22 awg sensor wires to the 16 gauge cable in the junction box and vent the sensor at the junction box. BMS Contractor shall make all final terminations inside the building and extend control wiring to the BMS panels.

2.14 INLINE FLOW 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. ERDCO Engineering Corp., See-Flo Meters

B. Characteristics:
1. Description: Variable Area Flow meter with indicator
2. Flow Range: Sensor and indicator shall cover operating range of equipment or system served.
3. Sensor: variable-area housing, alloy vane element
   a. Construction: Aluminum or Brass body, with carbon steel shunt, tempered glass window, and stainless steel vane.
   b. Minimum Pressure Rating: 100 psig
   c. Minimum Temperature Rating: 180°F

d. Maximum Pressure Drop: 5 psig

4. Indicator: integral part of sensor
5. Accuracy: Plus, or minus 2 percent.
6. Turndown: 10:1
7. Display: Shows rate of flow in gpm
8. Operating Instructions: Include complete instructions with each flowmeter.

2.15 WATER FLOW METER:

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings:
1. Onicon F-3100 series

B. Characteristics:
1. Description: In-Line Electromagnetic Flow Meter
2. Meter shall cover operating range of equipment or system served.
3. Sensor: Electromagnetic
4. Ambient Temperature Range: -4°F to 140°F
5. Output Signal: Isolated 4 -20 mA
6. Power Supply 90 to 265 VAC
7. Body: Carbon Steel
8. Flow Tube: 304 Stainless Steel

Flow Range: Sensor and indicator shall cover operating range of equipment or system served

PART 3 - EXECUTION

3.1 GENERAL

A. Control System component locations are the responsibility of the System Contractor. All control system components shall be installed in locations as required to properly sense the controlled medium and shall be easily accessible for adjustment and service. All components shall be installed in accordance with the component manufacturer's recommendations.

B. The system shall be installed such that all wiring, communication, analog or digital, input or output shall be capable of sharing single conduit runs without affecting signal performance.

C. The Contractor shall protect all work and material from damage by his/her work or workers, and shall be liable for all damage thus caused.

D. The Contractor shall be responsible for his/her work and equipment until finally inspected, tested and accepted. The Contractor shall protect his/her work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed.

E. After completion of installation, calibrate and commission all components provided as part of the Control System and demonstrate proper sequence of operation in compliance with Section 1.6. Equipment not operating correctly shall be field corrected or replaced.

F. Verify that power supply is available to control units and operator workstation.

3.2 DIRECT AND WEB ENABLED CONTROL SYSTEM APPLICATION SOFTWARE

A. At time of acceptance all operating system, Third party and Control System Application software shall be at least the latest version available.

B. Software programs are described to their general intent. It is recognized that Networked System manufacturer's software differ; however, the Application software provided shall incorporate the feature described fully implemented and optimized to provide the sequences described, minimize energy consumption and prolong equipment life.

C. All analog and binary values shall be programmed with appropriate alarms.

D. Except as specified otherwise, throttling ranges, proportional bands, and cycle differentials be centered on the associated set point.

E. All set points unless otherwise indicated are adjustable and shall be programmed for all control loops.

F. Each control loop or interlock for all mechanical system including terminal unit systems shall be programmed with a control loop specific graphical trend to trend all values associated with each specific control loop or system interlock.

G. Where any sequence or occupancy schedule calls for more than one motorized unit to start simultaneously, the start commands shall be staggered by 60-second (adj.) intervals to minimize inrush current.

H. Trend log/ historical data shall be implemented for every point on the system. Point trends shall be grouped into logically interrelated points for individual mechanical and PMCS systems. Initial set-up shall be to log values once every 5 minutes.

I. Valves positions shall be displayed on the BMS such that 0% shall indicate fully closed, and 100% shall indicate fully open, regardless of the NC/NO type of valve.

J. B-OWS Graphics
1. All sensors, control devices and set points shall be visible on a B-OWS in graphical form.
2. All mechanical systems shall have a programmed real time color graphic for primary graphical user interface.
   The only exception allowed will be unit heaters or finned tube, which require a tabular summary for the points associated with these systems.

3.3 CONTROL ENCLOSURES & SUB-PANELS

A. All system components not designed for or required to be field installed shall be mounted in a control enclosure. Those components shall be sub panel mounted except components that are mounted on the panel face. Provide on/off power switch with over-current protection for control power sources in each local enclosure.

B. All control enclosures shall be located so visual observation and adjustment can be accomplished while standing flatfooted on the floor in a convenient location adjacent to the

equipment served. Install all equipment in readily accessible location as defined by Chapter1 Article 100 Part A of the NEC.

C. Label all control system components.

D. All B-BC, B-AAC and B-ASC shall be mounted in an enclosure.

3.4 INTERCONNECTING WIRE AND CABLE

A. General
1. It shall be the System Contractor's responsibility to provide all wiring required for a complete Control System.
2. Control system wiring and cabling installed for this project shall include but may not be limited to the following:
   a. Include all required power wiring required weather indicated on plans or not indicated.
   b. Power to all actuators and, where required, sensors.
   c. Provide all wiring and cabling for network communications except for owner provided LAN's/WAN's.
   d. All sensor and control device input and output wiring.
   e. All interconnecting cabling between and amongst network devices, PCs printers, modems, etc.
   f. Interlock wiring between devices, and between motor starters.
   g. All other necessary wiring for fully complete and functional system as specified.
3. Install piping, wiring/cabling parallel to building lines.
4. Maximum allowable voltage for control wiring shall be 120-volts.
5. All wiring shall be installed as continuous links, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.
6. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
7. This Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.

B. Power Wiring and Cabling
1. All power wiring for the entire control system shall be from circuits on emergency power panels if available.
2. Power wiring for all enclosures and equipment, including branch circuit wiring from circuit breaker panels shall be the responsibility of the System Contractor.
3. All B-OWS equipment shall be served from isolated ground receptacles via UPS by dedicated branch circuits.
4. All other enclosures, sensor and control devices shall be fed from separate circuits in the electrical distribution panels and shall not be served from the typical floor receptacle or lighting circuits.

C. Network Wiring and Cabling
1. Network installation shall conform to standards for the LAN types and cabling types selected.
2. Primary LAN Network wire and cable shall be run in metallic conduit separately from all other wiring.
3. Other LAN Network wire and cabling shall be installed separate from any wiring over thirty (30) volts.

4. All communications shielding shall be grounded as per Networked System manufacturer's recommendations.
5. Contractor may elect to run unshielded cable if noise immunity is ensured by other means. Contractor will be fully responsible for noise immunity and rewire with shielded cable if electrical or RF noise affects performance.

D. Installation
1. Except in mechanical and electrical spaces where other conduits or piping is exposed, conceal wiring and cabling as much as possible and install as follows:
a. All exposed areas: in raceway or conduit as approved by Owner/Engineer

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

B. Control System Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check installation of air supply for each instrument.
5. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
6. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
7. Check temperature instruments, material, and length of sensing elements.
8. Check control valves. Verify that they are in correct direction.
9. Check air-operated dampers. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.
10. Check control system as follows:

a. Verify that controller power supply is from emergency power supply, if applicable.
b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
c. Verify that spare I/O capacity has been provided.
d. Verify that controllers are protected from power supply surges.

C. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.6 ADJUSTING

A. Calibrating and Commissioning:
1. Commission the control system. Document the commissioning and submit documentation prior to acceptance testing. Commissioning shall include the following:
2. Verify that each control panel has been installed according to the shop drawings and test, calibrate, and bring on-line each control device.
3. Each control program shall be put on-line and commissioned.
4. Verify the overall networked system performs as specified.
5. Subsystems not controlled electronically shall also be tested and commissioned.

6. Calibrate instruments.
7. Make three-point calibration test for both linearity and accuracy for each analog instrument.
8. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
9. Control System Inputs and Outputs:

    a. Check analog inputs at 0, 50, and 100 percent of span.
    b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
    c. Check digital inputs using jumper wire.
    d. Check digital outputs using ohmmeter to test for contact making or breaking.
    e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

10. Temperature:

    a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
    b. Calibrate temperature switches to make or break contacts.

11. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
12. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
13. Provide diagnostic and test instruments for calibration and adjustment of system.
14. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

3.7 DEMONSTRATION AND ACCEPTANCE TESTING

A. Using the documented calibration and commissioning test data the Owner and /or his representative shall select, at random, results to be demonstrated. At least 95 percent of the results demonstrated must perform as specified and documented on commissioning data sheets or the system must be re-calibrated and re-commissioned before being re-tested.

3.8 TRAINING

A. Operational Training Program
   1. The System Contractor shall furnish the services of competent instructors who will give instruction on the adjustment, and operation and maintenance of the control system provided. The System Contractor shall provide all equipment and material required for training for maximum of five trainees.
   2. This Contractor shall conduct a (4)-hour operational training program for the facility operating staff, which shall be exclusive of travel time. The owner shall schedule the training times and dates with the contractor.
   3. The on-site training shall cover the complete system and components. Schedule within one month of system acceptance. Training shall be done on the owners Control System and shall include:
      a. General equipment layout.
      b. Sequences of operation.
         1) Explanation of sequences
         2) Adjustment of Operating Schedules
         3) Adjustment of Setpoints
      c. Use of OWS software
      d. Use of OWS software for data collection
      e. Maintenance and repair.
      f. Troubleshooting.
      g. Preventative maintenance.
      h. Sensor calibration.
      i. Proper use of service material, and tools.

B. The instructor shall provide one copy of training material per student. Training sessions shall be videotaped at the discretion of the Owner’s Representative for future use by the building staff.

C. Ongoing Support
   1. In addition to the initial (4) hours of operator and supervisor training, the Contractor shall provide an additional (8) hours training during the first year of operation when requested by the owner’s representative.

END OF SECTION

SECTION 230993
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including any applicable General and Supplementary Conditions and any Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

Sequence of operation:

1. Chilled Water system
2. Hot Water system
3. Rooftop Air Handling Unit W/ ERV (AHU- 2)
4. Rooftop Air Handling Unit W/o ERV (AHU-1 and AHU-3)
5. Toilet Exhaust Fan (TEX-1, 2 and 3)
6. Janitor Closet Exhaust Fan (EF-1) and Learning Lab Exhaust Fan (EF-2)
7. VAV Boxes w/ Hot Water Reheat
8. VAV Boxes w/ Hot Water Reheat and Radiant Heating Panels (RHPs)

B. This project includes extending the existing control system to new Chiller #1. The sequences contained herein are intended to augment or replace the existing sequences in place for the subject equipment as applicable. Controls contractor shall be responsible for all system integration, materials, labor, programming, BMS system architecture, etc., as required to accomplish the desired new or modified sequence of operations. Provide new graphic interface representing the modified systems.

C. The controls contractor shall provide a control system complete with all necessary wiring, valves, interlocks, panels, etc. for the system to operate as specified in the sequence of operation.

D. The points lists contained in this section shall be construed as the *minimum* requirements for system data points, alarms and field sensors/devices. The contractor shall provide for all points required to achieve the desired sequence of operation as defined in this section, and shall provide a complete operating automatic temperature control system. Points specifically listed in this section shall be interpreted that a new end device or sensor is to be provided, unless otherwise noted.

E. Shop drawings: indicate all mechanical controlled components and control system components. Labeled with settings, and adjustable range of controls and limits. Include written description of control sequence.

F. Include flow diagrams for each control system, graphically depicting control logic. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

1.3 DEFINITIONS

A. AI / AO: Analog Input/Output

B. BI/BO: Binary Input/Output

C. VFD: Variable Frequency Drive

D. PID: Proportional-Integral-Differential

PART 2 - PRODUCTS

2.1 CONTROL DEVICES AND INSTALLATION

A. Provide devices, wiring, installation, calibration and programming to achieve the sequences contained herein using materials and methods specified in Section 230900 and applicable sections of Division 23

PART 3 - EXECUTION

3.1 Chilled Water System

A. The chilled water plant is comprised of one air cooled chiller and two chilled water pumps. The Chiller enables its associated chilled water pumps. The building management system (BMS) controls many of the chilled water pumps functions and setpoints, and monitors a number of points through the chiller interfaces.

B. The BMS shall monitor, control and include, but not limited to, the following points and the points shall be displayed on the graphics:
1. Start/Stop – Chiller #1
2. Run Status – Chiller #1
3. Start/Stop – Chilled Water Pump #1
4. Start/Stop – Chilled Water Pump #2
5. Run Status – Chilled Water Pump #1
6. Run Status – Chilled Water Pump #2
7. Flow Rate – Chilled Water Return
8. Temperature – Chiller #1 Chilled Water Supply
9. Temperature – Chiller #1 Chilled Water Return
10. Temperature – Outside Air
11. Position – CHW Bypass Valve
12. Command – CHW Bypass Valve
13. Pressure – Chiller Inlet Differential
14. Pressure – Chiller Outlet Differential

15. Pressure – Chilled Water System Differential
16. Setpoint – Chiller #1 Chilled Water Supply Temperature
17. Setpoint – Chilled Water Setpoint Adjust
18. Setpoint – Outside Air Enable Setpoint
19. Alarm – Chiller #1 General Alarm
20. Alarm – High CHWS Temperature
21. Alarm – Low CHWS Temperature
22. Alarm – High Differential Pressure Across Chiller
23. Alarm – Low Differential Pressure Across Chiller
24. Alarm – Pump VFD Alarm
25. Alarm – Low CHW System Differential Pressure
26. Alarm – High CHW System Differential Pressure
27. Alarm – Glycol Feed
28. Alarm – Low/ No CHW Flow

C. Sequence:

1. Chilled Water Plant Enable/ Staging:
   a. Enable Conditions:
      The chilled water plant will be enabled through the BMS based on the following conditions:
      1) Outside air temperature > 65°F (adjustable)
      2) At least one chilled water control valve for the main rooftop units is a minimum of 20% open for 20 minutes (adjustable)
      3) Glycol fill system status is normal.
   b. Disable Conditions:
      The chilled water plant will be disabled through the BMS based on the following conditions:
      1) Outside air temperature is 5°F below enable setpoint
      2) All chilled water control valves for the main air handling units are less than 10% open for 20 minutes (adjustable)
      3) Glycol fill system status indicates a fault or low glycol level.

2. Chiller (CH-1)
   a. When enabled by the BMS, chiller to perform its startup procedure through its local controller.
   b. When disabled by the BMS, chiller to perform its shut down procedure through its local controller.
   c. Chiller to disable upon no/low flow alarm as sensed by the chiller differential pressure sensor
   d. Any chiller alarms to be indicated at the BMS front end. Critical chiller alarms to be manually reset.
   e. Monitor compressor status (run status for each compressor).
   f. Monitor condenser fan status (run status for each fan).

3. Chilled Water Pump Control
   a. Chilled water pumps to be enabled when the associated chiller is enabled.
   b. The BMS shall monitor the differential pressure across the chiller evaporator.

c. The pump shall modulate to maintain the loop differential pressure setpoint (to be determined by the TAB contractor) as sensed by a differential pressure sensor located 2/3 downstream of the distribution piping
d. Pump flow to be set through the associated VFD by the balancer.
e. Monitor pump VFD speed control and status.
f. Monitor alarm for low system pressure.

4. Chilled Water Temperature Reset:
   a. When the chilled water plant is enabled the chilled water supply temperature setpoint is to be 44°F. Once the chilled water supply temperature reaches setpoint the reset sequence is to be enabled
   b. The chilled water temperature setpoint to modulate from 44°F to 48°F
   c. If all of the chilled water control valves for the main roof top air handling units are less than 50% open the chilled water supply setpoint is to be increased by 1°F
   d. If any of the chilled water control valves reach 90% open the chilled water supply setpoint is to be reduced by 1°F
   e. Chilled water reset sequence to be disabled and chilled water supply temperature setpoint shall default to 44°F when any of the main air handling units return air humidity levels exceeds 65% RH. The sequence to be re-enabled if all return air humidity levels are lower than 60% RH

3.2 Hot Water System

A. The hot water plant is comprised of two hot water condensing boilers, two primary boiler hot water pumps and two secondary system hot water pumps. The boiler enables its associated primary water pumps. The building management system (BMS) controls many of the secondary system hot water pumps functions and setpoints, and monitors a number of points through the boiler interfaces.

B. The BMS shall monitor, control and include, but not limited to, the following points and the points shall be displayed on the graphics:
   1. Start/Stop – Boiler #1
   2. Start/Stop – Boiler #2
   3. Start/Stop – Primary Hot Water Pump #1
   4. Start/Stop – Primary Hot Water Pump #2
   5. Start/Stop – Secondary Hot Water Pump #1
   6. Start/Stop – Secondary Hot Water Pump #2
   7. Run Status – Boiler #1
   8. Run Status – Boiler #2
   9. Command – Boiler #1 Isolation Valve
   10. Command – Boiler #2 Isolation Valve
   11. Position – Boiler #1 Isolation Valve
   12. Position – Boiler #1 Isolation Valve
   13. Open/Close – Boiler #1 Isolation Valve
   14. Open/Close – Boiler #2 Isolation Valve
   15. Burner Modulation – Boiler #1
   16. Burner Modulation – Boiler #2
   17. Run Status – Primary Hot Water Pump #1
   18. Run Status – Primary Hot Water Pump #2

19. Flow Status – Primary Hot Water Pump #1
20. Flow Status – Primary Hot Water Pump #2
21. VFD Speed – Primary Hot Water Pump #1
22. VFD Speed – Primary Hot Water Pump #2
23. Run Status – Secondary Hot Water Pump #1
24. Run Status – Secondary Hot Water Pump #2
25. Flow Status – Secondary Hot Water Pump #1
26. Flow Status – Secondary Hot Water Pump #2
27. VFD Speed – Secondary Hot Water Pump #1
28. VFD Speed – Secondary Hot Water Pump #2
29. Temperature – System Hot Water Supply
30. Temperature – System Hot Water Return
31. Temperature – Outside Air
32. Pressure – Hot Water System Differential
33. Position – Hot water System Bypass Valve
34. Alarm – Boiler #1 General Alarm
35. Alarm – Boiler #2 General Alarm
36. Alarm – Boiler # 1 Low Water Level
37. Alarm – Boiler # 2 Low Water Level
38. Alarm – High Hot Water Supply Temperature
39. Alarm – Low Hot Water Supply Temperature
40. Alarm – Primary Pump #1 VFD Fault
41. Alarm – Primary Pump #2 VFD Fault
42. Alarm – Secondary Pump #1 VFD Fault
43. Alarm – Secondary Pump #2 VFD Fault
44. Alarm – Main Low Water Cutoff
45. Alarm – Auxiliary Low Water Cutoff
46. Alarm – High Pressure
47. Alarm – High/Low Zone Temperatures

C. Sequence:

1. Hot water plant enable/ staging:
    a. The hot water plant will be enabled through the BMS based on the following conditions:
        1) Outside air temperature < 65°F (adj.)
    b. The boilers will operate on an adjustable lead/lag duty schedule by the BMS.
    c. Upon a call for heating, the isolation valve of the lead boiler will be commanded open, the associated primary pump and lead secondary pump will be commanded on. Upon proof of flow, the lead boiler will be activated. If flow is not proven within an adjustable time period, the lag components will be activated an alarm will be generated at the BMS.
    d. The hot water plant will be disabled through the BMS based on the following conditions:
        1) Outside air temperature is 5°F above enable setpoint

2. Boilers (B-1, B-2)
    a. When enabled by the BMS, boiler to perform its startup procedure through its local controller

b. The boiler firing rate shall modulate to maintain the supply header temperature setpoint. Boiler master controller to stage lag boiler as required to maintain supply header temperature setpoint.
c. When disabled by the BMS, boiler to perform its shut down procedure through its local controller
d. If the main or auxiliary low water cutoff is activated, the boiler will be immediately commanded OFF to prevent damage, and an alarm will be generated at the BMS
e. Any boiler alarms to be indicated at the BMS front end. Critical chiller alarms to be manually reset

3. Primary Hot Water Pump Control
   a. Primary hot water pumps to be enabled when the associated boilers are enabled and shall operate at a constant speed.
   b. Pump flow to be set through the associated VFD by the balancer.

4. Secondary Hot Water Pump Control
   a. Secondary hot water pumps to be enabled when the hot water system is enabled.
   b. The lead secondary water system pump shall modulate to maintain the loop differential pressure setpoint (to be determined by the TAB contractor) as sensed by a differential pressure sensor located 2/3 downstream of the distribution piping
   c. Pump flow to be set through the associated VFD by the balancer

5. Hot Water Temperature Reset:
   a. When the hot water plant is enabled the hot water supply temperature setpoint is to be 160°F. Once the hot water supply temperature reaches setpoint the reset sequence is to be enabled.
   b. The hot water temperature setpoint to modulate from 160°F to 140°F inversely proportional to changes in outside air temperature. The BMS will cycle the boiler burner controls to maintain the hot water supply temperature as scheduled:
      1) Outdoor air temperature 30°F: 160°F (adj.) hot water supply temperature
      2) Outdoor air temperature 60°F: 140°F (adj.) hot water supply temperature

3.3 Rooftop Air Handling Unit w/o ERV (AHU-1 and 3)

A. The BMS shall monitor, control and include, but not limited to, the following points and the points shall be displayed on the graphics:
1. Start/Stop – Supply Fan
2. Start/Stop – Return Fan
3. Status – Supply Fan
4. Status – Return Fan
5. Speed – Supply Fan
6. Speed – Return Fan
7. Command – Outdoor Air Damper
8. Position – Outdoor Air Damper
9. Command – Return Air Damper
10. Position – Return Air Damper
11. Command – Cooling Coil Valve
12. Position – Cooling Coil Valve
13. Command – Heating Coil Valve
14. Position – Heating Coil Valve
15. Temperature – Mixed Air
16. Temperature – Supply Air
17. Temperature – Return Air
18. Temperature – Outdoor Air
19. Humidity – Outdoor Air
20. CO2 Level – Outdoor Air
21. Air Flow – Supply Air
22. Air Flow – Exhaust Air
23. Pressure – Supply Air Static
24. Pressure – Differential Across Filters
25. Alarm – Supply Fan VFD Status
26. Alarm – Return Fan VFD Status
27. Alarm – Freezestat
28. Alarm – Dirty Filter Alarm
29. Alarm – High/ Low Supply Air Temperature

B. Sequence:

1. Occupied Mode:
   a. The roof top unit shall be indexed to occupied mode based on an occupancy schedule as determined by the BMS
   b. When the unit is commanded on, the outdoor air damper shall be indexed “OPEN” and modulate to its minimum required position (determined by the TAB contractor), the return air damper shall be indexed “OPEN”, and the unit supply fan and return fan VFDs will be indexed “ON”.
2. Fan Speed Control
   a. The AHU supply fan speed shall modulate to maintain a supply duct static pressure set-point of 1.5” WC (final set-point to be determined by balancer).
   b. Minimum fan speed shall be determined by balancer.
   c. The BMS shall continuously monitor the damper position of all VAV terminal units. When any damper is more than 95% (adjustable) “open”, the supply fan discharge duct static pressure set-point shall be reset upward by 5% (adjustable) of

the maximum system static pressure set-point, at a frequency of 10 minutes (adjustable). Until no damper is more that 95% "open" or the minimum set-point has been reached, or the VFD has reached the maximum setting. When all dampers are less than 85% "open", (adjustable), the supply fan discharge duct static pressure set-point shall be reset downward by 5% (adjustable) of the maximum system static pressure set-point at a frequency of 10 minutes (adjustable) until any damper is more that 85% "open", or the minimum set-point has been reached, or the VFD is at the minimum setting. The control bands, setpoint increment values, set-point decrement values and adjustment frequences shall be adjusted to maintain maximum static pressure optimization with stable system control and maximum comfort control.

d. The return fan shall be interlocked with the supply fan and shall modulate as required meet setpoint (80% of Supply Fan speed, adj.).

3. Supply Air Temperature Control
   a. When the unit is enabled the supply temperature setpoint shall be 55°F. The AHU preheat coil and cooling coil control valves shall modulate as required to maintain supply air temperature of 55°F. The preheat coil and cooling coil control valves shall not be commanded open at the same time.
4. Economizer Mode
   a. Economizer mode shall be enabled when outdoor air enthalpy is below return air enthalpy and the outside air dry bulb temperature is below the high-limit temperature of 65ºF (adj.)
   b. When economizer mode is enabled and the unit is in cooling mode, mechanical cooling shall be initially disabled, and the outdoor air damper shall modulate beyond its minimum position (up to 100% open) to maintain supply air temperature setpoint of 55°F (adj.) After outside air damper is at maximum 100% position, if additional cooling is called for, the chilled water valve shall modulate open to maintain the supply air temperature setpoint.
5. Demand Controlled Ventilation (DCV) Mode
   a. Furnish combination space temperature/CO_2 sensors where shown on plans. The BMS shall monitor all space CO_2 sensors and report the peak value to the AHU controller.
   b. The BMS shall dynamically control the outdoor, return, and exhaust air dampers in sequence to control and maintain the required min/max CO_2 concentration in the space. On a rise above the space CO_2 setpoint (1,100 ppm (adj.)) the outdoor air and exhaust air dampers shall modulate open, and the return air damper shall modulate closed as required to maintain the space CO_2 setpoint.
   c. The outside air intake dampers normal minimum positions shall be 20% of the design outside air rate or shall be established based on the schedules contained on the plans, whichever is higher. When operating in demand-controlled ventilation mode (normal occupied mode) the outside air damper position may be reset according to demand with the above lower limit.
6. Preoccupancy Purge Mode
   a. The outside air, return air, and exhaust air dampers shall be positioned, and all fans shall be running, to provide the maximum quantity of outside air for 30 minutes prior to occupancy.
7. Post Occupancy Flush Mode
   a. The outside air, return air, and exhaust air dampers shall be positioned, and all fans shall be running, to provide minimum ventilation flow rates to reduce CO_2 concentration in the space to outside air levels prior to shutting down.

8. Unoccupied Mode
    a. When the unit is scheduled to unoccupied, the supply fan shall be disabled.
    b. The outdoor air and exhaust air dampers shall be commanded closed.
    c. The cooling/ heating coil control valves shall be commanded closed.
    d. If any zone temperature is above/below unoccupied space temperature setpoint (65°F heating, 80°F cooling (adj.)), the AHU shall be enabled and the heating/cooling coil control valves shall modulate as required to maintain their respective setpoints.

3.4 Rooftop Air Handling Unit w/ Energy Recovery (AHU-2)

A. The BMS shall monitor, control and include, but not limited to, the following points and the points shall be displayed on the graphics:
1. Start/Stop – Supply Fan
2. Start/Stop – Exhaust Fan
3. Start/Stop – Energy Recovery Wheel (ERW)
4. Status – Energy Recovery Wheel
5. Status – Supply Fan
6. Status – Exhaust Fan
7. Speed – Supply Fan
8. Speed – Exhaust Fan
9. Enable/Disable – Energy Recovery Wheel Frost Protection
10. Command – Outdoor Air Damper
11. Position – Outdoor Air Damper
12. Command – Return Air Damper
13. Position – Return Air Damper
14. Command – Exhaust Air Damper
15. Position – Exhaust Air Damper
16. Command – Cooling Coil Valve
17. Position – Cooling Coil Valve
18. Command – Heating Coil Valve
19. Position – Heating Coil Valve
20. Temperature – Mixed Air
21. Temperature – Supply Air
22. Temperature – Return Air
23. Temperature – Outdoor Air
24. Humidity – Outdoor Air
25. CO2 Level – Outdoor Air
26. Air Flow – Supply Air
27. Air Flow – Return Air
28. Pressure – Supply Air Static
29. Pressure – Differential Across Filters
30. Alarm – Supply Fan VFD Status
31. Alarm – Exhaust Fan VFD Status
32. Alarm – Freezestat
33. Alarm – Dirty Filter Alarm
34. Alarm – High/ Low Supply Air Temperature

B. Sequence:

1. Occupied Mode:
   a. The roof top unit shall be indexed to occupied mode based on an occupancy schedule as determined by the BMS
   b. When the unit is commanded on, the outdoor air damper shall be indexed “OPEN” and modulate to its minimum required position (determined by the TAB contractor), the return air and exhaust air dampers shall be indexed “OPEN”, the unit supply fan and exhaust fan VFDs will be indexed “ON”, and the ERW will be commanded on.

c. The ERW shall be enabled/disabled during outside air operation. Internal wheel-bypass shall vary the effectiveness of the wheel to adjust energy recovery efficiency based on manufacturer-recommended controls setpoints.

2. Fan Speed Control
   a. The AHU supply fan speed shall modulate to maintain a supply duct static pressure set-point of 1.5" WC (final set-point to be determined by balancer).
   b. Minimum fan speed shall be determined by balancer.
   c. The BMS shall continuously monitor the damper position of all VAV terminal units. When any damper is more than 95% (adjustable) "open", the supply fan discharge duct static pressure set-point shall be reset upward by 5% (adjustable) of the maximum system static pressure set-point, at a frequency of 10 minutes (adjustable). Until no damper is more that 95% "open" or the minimum set-point has been reached, or the VFD has reached the maximum setting. When all dampers are less than 85% "open", (adjustable), the supply fan discharge duct static pressure set-point shall be reset downward by 5% (adjustable) of the maximum system static pressure set-point at a frequency of 10 minutes (adjustable) until any damper is more that 85% "open", or the minimum set-point has been reached, or the VFD is at the minimum setting. The control bands, setpoint increment values, set-point decrement values and adjustment frequences shall be adjusted to maintain maximum static pressure optimization with stable system control and maximum comfort control.
   d. The AHU exhaust fan shall be interlocked with the supply fan and shall modulate as required meet setpoint (80% of Supply Fan speed, adj.).
3. Supply Air Temperature Control:
   a. When the unit is enabled the supply temperature setpoint shall be 55°F. The AHU preheat coil and cooling coil control valves shall modulate as required to maintain supply air temperature of 55°F. The preheat coil and cooling coil control valves shall not be commanded open at the same time.
4. Economizer Mode
   a. Economizer mode shall be enabled when outdoor air enthalpy is below return air enthalpy and the outside air dry bulb temperature is below the high-limit temperature of 65ºF (adj.)
   b. When economizer mode is enabled and the unit is in cooling mode, mechanical cooling shall be initially disabled, and the outdoor air damper shall modulate beyond its minimum position (up to 100% open) to maintain supply air temperature setpoint of 55°F (adj.) After outside air damper is at maximum 100% position, if additional cooling is called for, the chilled water valve shall modulate open to maintain the supply air temperature setpoint.
5. Demand Controlled Ventilation (DCV) Mode
   a. Furnish combination space temperature/CO2 sensors where shown on plans. The BMS shall monitor all space CO_2 sensors and report the peak value to the AHU controller.
   b. The BMS shall dynamically control the outdoor, return, and exhaust air dampers in sequence to control and maintain the required min/max CO_2 concentration in the space. On a rise above the space CO_2 setpoint (1,100 ppm (adj.)) the outdoor air and exhaust air dampers shall modulate open, and the return air damper shall modulate closed as required to maintain the space CO2 setpoint.
   c. The outside air intake dampers normal minimum positions shall be 20% of the design outside air rate or shall be established based on the schedules contained on the plans, whichever is higher. When operating in demand-controlled ventilation

mode (normal occupied mode) the outside air damper position may be reset according to demand with the above lower limit.

6. Energy Recovery Wheel Operation
   a. The unit ERV shall be energized to operate with the AHU.
   b. Units shall be arranged to go into "Stop-Start-Jog" mode when the AHU is in Economizer mode. The energy recovery wheel shall stop spinning to allow air to pass without energy transfer and will spin intermittently in order to keep the wheel clean.
   c. The units internal controls shall be arranged to prevent unit freeze up with heating coil or through wheel speed control.
7. Preoccupancy Purge Mode
   a. The outside air, return air, and exhaust air dampers shall be positioned, and all fans shall be running, to provide the maximum quantity of outside air for 30 minutes prior to occupancy.
8. Post Occupancy Flush Mode
   a. The outside air, return air, and exhaust air dampers shall be positioned, and all fans shall be running, to provide minimum ventilation flow rates to reduce CO_2 concentration in the space to outside air levels prior to shutting down.
9. Unoccupied Mode
   a. When the unit is scheduled to unoccupied, the supply fan shall be disabled.
   b. The outdoor air and exhaust air dampers shall be commanded closed.
   c. The cooling/ heating coil control valves shall be commanded closed.
   d. If any zone temperature is above/below unoccupied space temperature setpoint (60°F heating, 80°F cooling (adj.)), the AHU shall be enabled and the heating/cooling coil control valves shall modulate as required to maintain their respective setpoints.

3.5 Toilet Exhaust Fan (TEX-1,2 and 3)

A. The BMS shall monitor, control and include, but not limited to, the following points and the points shall be displayed on the graphics:
   1. Start/Stop – Fan
   2. Status - Fan
   3. Alarm – Fan Status

B. Sequence:

   1. The toilet exhaust fan shall be started and stopped either manually or automatically from the BMS and/or at the motor starter. The fan shall run based on the following time of day schedule (ADJ.):
      a. Normal Occupied mode (weekday): M-SUN, 9AM – 9PM.
      b. Normal Occupied mode (weekend): M-SUN, 11AM – 4PM.

3.6 Janitor Closet Exhaust Fan (EF-1) and Learning Lab Exhaust Fan (EF-2)

A. Sequence:

1. The exhaust fan shall be started and stopped manually via the wall mounted toggle switch located in Janitor Closet 2B and shall run continuously.

2. The exhaust fan shall be started and stopped manually via the wall mounted toggle switch located in Learning Lab 8B and shall run continuously.

3.7 VAV Boxes w/ Reheat

A. The BMS shall monitor, control and include, but not limited to, the following points and the points shall be displayed on the graphics:
1. Zone Space Temperature
2. Zone Space Temperature Setpoint
3. Zone Space CO_2 (Qty. 2)
4. Zone Space CO_2 Setpoint
5. Reheat Coil Control Valve Command
6. Reheat Coil Control Valve Feedback
7. VAV Discharge Air Temperature
8. VAV Damper Position
9. Alarm – High Space Temperature
10. Alarm – Low Space Temperature
11. Alarm – High Space CO_2 Level
12. Alarm – CO_2 Sensor Error

B. Sequence:

1. Occupancy Scheduling:
   a. Occupancy will be based on the respective AHU mode of operation.

2. Occupied Mode
   a. The VAV box will be under control of its respective DDC controller.
   b. For VAV boxes served by multiple space temperature sensors, the BMS shall calculate the average space temperature, and that value shall be used to determine if the VAV is in cooling or heating mode.
   c. During cooling mode, the box will modulate to maintain its calculated airflow setpoint between minimum and maximum cooling airflow setpoints to maintain the space temperature occupied cooling setpoint. As the space temperature increases, the airflow setpoint shall increase until the maximum flow setpoint is reached. The reverse shall occur as the space temperature decreases.
   d. During heating mode, the box will modulate to maintain the heating airflow setpoint.
   e. The VAV reheat coil control valve shall be commanded open and modulate as required to maintain discharge air temperature setpoint (95°F adj.)

3. Demand Control Ventilation Mode
   a. When the space CO_2 level rises above setpoint (1,100 ppm (adj.)) the active VAV sequence shall be overridden and the VAV shall enter DCV mode. The VAV shall modulate its damper position to maintain maximum cooling airflow setpoint until space CO2 levels drop below setpoint.
   b. The BMS shall monitor the primary and redundant space CO2 sensors associated with each VAV box. If the difference in CO2 levels between the sensors exceeds ten percent (10%), an alarm shall be generated at the BMS.

3.8 VAV Boxes w/ Reheat and Radiant Heating Panels (RHPs)

A. The BMS shall monitor, control and include, but not limited to, the following points and the points shall be displayed on the graphics:
   1. Zone Space Temperature
   2. Zone Space Temperature Setpoint
   3. Zone Space CO_2 (Qty. 2)
   4. Zone Space CO_2 Setpoint
   5. Reheat Coil Control Valve Command
   6. Reheat Coil Control Valve Feedback
   7. Radiant Heat Panel Valve Command
   8. Radiant Heat Panel Valve Feedback
   9. VAV Discharge Air Temperature
   10. VAV Damper Position
   11. Alarm – High Space Temperature
   12. Alarm – Low Space Temperature
   13. Alarm – High Space CO_2 Level
   14. Alarm – CO_2 Sensor Error

B. Sequence:

   1. Occupancy Scheduling:
      a. Occupancy will be based on the respective AHU mode of operation

   2. Occupied Mode
      a. The VAV box will be under control of its respective DDC controller.
      b. For VAV boxes served by multiple space temperature sensors, the BMS shall calculate the average space temperature and that value shall be used to determine if the VAV is in cooling or heating mode.
      c. During cooling mode, the box will modulate to maintain its calculated airflow setpoint between minimum and maximum cooling airflow setpoints to maintain the space temperature occupied cooling setpoint. As the space temperature increases, the airflow setpoint shall increase until the maximum flow setpoint is reached. The reverse shall occur as the space temperature decreases.
      d. During heating mode, the box will modulate to maintain the heating airflow setpoint.
      e. The RHP shall be the first stage of heating. If the RHP control valve is fully open and space temperature is still below setpoint, the VAV reheat coil control valve shall be commanded open and modulate as required to maintain discharge air temperature setpoint (95°F adj.)

3. Demand Control Ventilation Mode
   a. When the space CO_2 level rises above setpoint (1,100 ppm (adj.)) the active VAV sequence shall be overridden and the VAV shall enter DCV mode. The VAV shall modulate its damper position to maintain maximum cooling airflow setpoint until space CO_2 levels drop below setpoint.
   b. For VAV boxes served by multiple CO_2 sensors, the BMS shall use the highest CO_2 sensor reading to determine if the VAV is in DCV mode.
   c. The BMS shall monitor the primary and redundant space CO2 sensors associated with each VAV box. If the difference in CO2 levels between the sensors exceeds ten percent (10%), an alarm shall be generated at the BMS.

END OF SECTION

SECTION 232113
HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1. Chilled water piping
2. Hot water piping
3. Condenser water piping
4. Condensate drain piping
5. Air-vent piping.
6. Safety-valve-inlet and -outlet piping.

B. Related Sections include the following:

1. Division 23 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.3 DEFINITIONS

A. PTFE: Polytetrafluoroethylene.

B. RTRF: Reinforced thermosetting resin (fiberglass) fittings.

C. RTRP: Reinforced thermosetting resin (fiberglass) pipe.

1.4 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Chilled-Water Piping: 100 psig at 100 deg F.
2. Hot-Water Heating Piping: 100 psig at 200 deg F.
3. Condenser-Water Piping: 100 psig at 200 deg F.
4. Condensate-Drain Piping: 150 deg F.
5. Air-Vent Piping: 200 deg F.

6. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
2. Air control devices.
3. Hydronic specialties.

B. Shop Drawings: Detail, at 1/4 scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

C. Welding certificates.

D. Qualification Data: For Installer.

E. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

1.7 EXTRA MATERIALS

A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

B. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L ASTM B 88, Type M .

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.

C. Wrought-Copper Fittings: ASME B16.22.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Anvil International, Inc.
b. S. P. Fittings; a division of Star Pipe Products.
c. Victaulic Company of America.

D. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.

C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.

D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.

E. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

G. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Central Plastics Company.
b. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
c. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.

2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric-Flange Kits:

1. 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. Calpico, Inc.
   b. Central Plastics Company.
   c. Pipeline Seal and Insulator, Inc.

2. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
3. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Calpico, Inc.
   b. Lochinvar Corporation.

2. Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

G. Dielectric Nipples:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Perfection Corporation; a subsidiary of American Meter Company.
   b. Precision Plumbing Products, Inc.

c. Victaulic Company of America.

2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.5 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "General-Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section "Instrumentation and Control for HVAC."

C. Bronze, Calibrated-Orifice, Balancing Valves:

1. 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. Armstrong Pumps, Inc.
   b. Bell & Gossett Domestic Pump; a division of ITT Industries.
   c. Taco.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. 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. Armstrong Pumps, Inc.
   b. Bell & Gossett Domestic Pump; a division of ITT Industries.
   c. Taco.

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.

9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

2.6 AIR CONTROL 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. Amtrol, Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett Domestic Pump; a division of ITT Industries.

C. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

D. Automatic Air Vents:

1. Body: High capacity cast iron.
2. Internal Parts: Nonferrous.
3. Operator: Noncorrosive metal float.
4. Inlet Connection: NPS 3/4.
5. Discharge Connection: NPS 1/4.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 240 deg F.
8. Compatible with propylene glycol

2.7 ASME Full Bladder Type Expansion Tanks

A. Manufacturers:

1. Taco, Inc; Model PAX130-150
2. ITT Bell & Gossett
3. Amtrol Inc
4. Substitutions: See Section 01600 - Product Requirements.

B. Construction: Welded steel, designed, tested and stamped in accordance with ASME (BPV code sec VIII, div 1); supplied with National Board Form U-1, rated for working pressure of 150 psi , with flexible heavy duty butyl rubber bladder. Bladder shall be able to accept the full

volume of the expansion tank and shall be removable and replaceable. Bladder shall be NSF 61 rated for potable water service and shall be manufactured with FDA approved materials.

C. Accessories: Pressure gage (field installed by others) and air-charging fitting ; precharge to 12 psig.

D. Automatic Cold Water Fill Assembly (field installed by others): Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

E. Size:

1. Capacity: 34 Gallons CHW
2. Capacity of submitted tanks must be equal to or greater than specified units. No exceptions unless stated in an addendum.

F. Chilled Water System:

1. Select expansion tank pressure relief valve at 150 psi maximum.
2. Set pressure reducing valve at150 psi

2.8 Buffer Tank

A. Manufacturers:

1. Taco, Inc; BT Series H0400F02-125N
2. Spirotherm.
3. Flamco
4. Substitutions: See Section 01600 - Product Requirements.

B. The Buffer Tank shall be constructed of steel. It shall be designed, fabricated and stamped per ASME Section VIII Division 1 with a maximum working pressure of 125 psi at 375°F. Manufacturer shall be holder of ASME U stamp and registered with the National Board of Pressure Vessel Manufacturers. Manufacturer to have optional 150 psi and 250 psi ASME units available. The volume of the vessel and the system connections sizes shall be as called out on the schedule.

C. The pressure vessel shall consist of two system connections that are arranged on the tank in a manner that promotes mixing with an internal baffle.

D. All units with 2” and larger connections sizes shall be provided with flanged connections as standard. Both inlet and outlet to be in the same horizontal and vertical planes.

2.9 BYPASS CHEMICAL FEEDER

A. Description: Welded steel construction; 125-psig (860-kPa) working pressure; 5-gal. (19-L) capacity; with fill funnel and inlet, outlet, and drain valves.

1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

2.10 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

B. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Stainless Steel Bellows, Flexible Connectors:
1. Body: Stainless steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

D. Spherical, Rubber, Flexible Connectors:
1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Chilled water piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.

2. ASTM B 88, Type L Copper pipe, Wrought-Copper Fittings: ASME B16.22, and soldered joints.

B. Chilled water piping, aboveground, NPS 2-1/2 and larger, shall be the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

C. Condensate-Drain Piping: Type M , drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Division 23 Section "General-Duty Valves for HVAC Piping."

Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

T. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."

U. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.

2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. NPS 4: Maximum span, 14 feet; minimum rod size, 1/2 inch.
8. NPS 6: Maximum span, 17 feet; minimum rod size, 1/2 inch.
9. NPS 8: Maximum span, 19 feet; minimum rod size, 5/8 inch.
10. NPS 10: Maximum span, 20 feet; minimum rod size, 3/4 inch.
11. NPS 12: Maximum span, 23 feet; minimum rod size, 7/8 inch.
12. NPS 14: Maximum span, 25 feet; minimum rod size, 1 inch.
13. NPS 16: Maximum span, 27 feet; minimum rod size, 1 inch.
14. NPS 18: Maximum span, 28 feet; minimum rod size, 1-1/4 inches.
15. NPS 20: Maximum span, 30 feet; minimum rod size, 1-1/4 inches.

D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
6. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.

E. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.

C. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

D. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain.

E. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches above the floor. Install feeder in minimum NPS 3/4 bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

F. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

G. Buffer tank and expansion tank to be installed on the suction side of the system pumps. Expansion tank to be tied into system piping in close proximity to buffer tank and system fill line.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gages for HVAC Piping."

3.8 CHEMICAL TREATMENT

A. Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling, and to sustain the following water characteristics:
1. pH: 9.0 to 10.5.
2. "P" Alkalinity: 100 to 500 ppm.
3. Boron: [100 to 200] ppm.
4. Chemical Oxygen Demand: Maximum of [100] ppm.
5. Corrosion Inhibitor:
    a. Sodium Nitrate: [1000 to 1500] ppm.
    b. Molybdate: [200 to 300] ppm.
    c. Chromate: [200 to 300] ppm.
    d. Sodium Nitrate Plus Molybdate: [100 to 200] ppm each.
    e. Chromate Plus Molybdate: [50 to 100] ppm each.
6. Soluble Copper: Maximum of [0.20] ppm.
7. Tolyiriazole Copper and Yellow Metal Corrosion Inhibitor: Minimum of [10] ppm.
8. Total Suspended Solids: Maximum of [10] ppm.
9. Ammonia: Maximum of [20] ppm.
10. Free Caustic Alkalinity: Maximum of [20] ppm.
11. Microbiological Limits:
    a. Total Aerobic Plate Count: Maximum of [1000] organisms/mL.
    b. Total Anaerobic Plate Count: Maximum of [100] organisms/mL.
    c. Nitrate Reducers: [100] organisms/mL.
    d. Sulfate Reducers: Maximum of [zero] organisms/mL.
    e. Iron Bacteria: Maximum of [zero] organisms/mL.

B. Install bypass chemical feeders in each hydronic system where indicated.

1. Install in upright position with top of funnel not more than 48 inches above the floor.
2. Install feeder in minimum NPS 3/4 bypass line, from main with full-size, full-port, ball valve in the main between bypass connections.

3. Install NPS 3/4 pipe from chemical feeder drain to nearest equipment drain and include a full-size, full-port, ball valve.

C. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.

D. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.

3.9 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.

4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION

SECTION 232123
HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Separately coupled, base-mounted, double-suction centrifugal pumps.

1.2 DEFINITIONS

A. ECM: Electronically commutated motor.

B. EPDM: Ethylene propylene diene monomer.

C. EPR: Ethylene propylene rubber.

D. EPT: Ethylene propylene terpolymer.

E. FKM: Fluoroelastomer polymer.

F. HI: Hydraulic Institute.

G. NBR: Nitrile rubber or Buna-N.

H. ODP: Open, drip proof.

I. TEFC: Totally enclosed, fan-cooled.

J. TENV: Totally enclosed, non-ventilated.

K. VFD: Variable-frequency controller.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of pump.

1. Include published performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated.
2. Indicate pump's operating point on curves.

B. Shop Drawings: For each pump.

1. Show pump layout and connections.

2. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
3. Include diagrams for power, signal, and control wiring.

C. Delegated Design Submittal: For each pump.

1. Design calculations and vibration isolation base details, signed and sealed by a qualified engineer.

a. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
b. 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.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

B. Seismic Qualification Data: Certificates for pumps, accessories, and components.

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.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps to include in operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish spare parts that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Seal Kit: One mechanical seal kit(s) for each pump.
2. Bearings.
3. Gaskets.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide pumps and associated equipment that are in compliance with energy conservation guidelines published in 2020 by the U.S. Department of Energy Rulemaking Committee for commercial and industrial pumps.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design vibration isolation[and seismic restraints.

D. Seismic Performance: Pumps to 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[and the unit will be fully operational after the seismic event."

2.2 SEPARATELY COUPLED, BASE-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Taco Comfort Solutions, Inc.; FI 1509D or comparable product by one of the following:

1. Bell & Gossett.
2. Thrush Co. Inc.

B. Source Limitations: Obtain pumps from single source from single manufacturer.

C. Description: Factory-assembled and -tested, centrifugal, API 610-OH1-type, overhung-impeller, separately coupled, end-suction pump with flexible shaft coupling as defined in HI 14.1, HI 14.2 and HI 14.3; designed for base mounting, with pump and motor shafts horizontal.

A. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gauge tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections. [Pump volute shall be foot mounted]
2. Impeller: ASTM B584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps that are not variable-frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft Sleeve: [Type 303 stainless steel]
4. Pump Shaft: [Type 416 stainless steel].
5. Seal, Mechanical Type: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless steel spring, and [NBR] [EPDM] [FKM] bellows and gasket.

6. Pump Bearings: Grease-lubricated ball bearings in cast-iron housing with grease fittings for lubrication in field.

B. Shaft Coupling: Molded-rubber insert capable of absorbing vibration. Spacer couplings to be drop-out type. EPDM coupling sleeve for variable-frequency applications.

C. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.

D. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A36/A36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.

E. Motor: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
1. NEMA Premium Efficient motors as defined in NEMA MG 1.
2. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
3. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
4. Variable speed motor.
5. Provide pump motor variable-frequency controller.

F. Capacities and Characteristics:

1. Capacity: 90 gpm (ea.)
2. Total Dynamic Head: 70 Ft H_2O
3. Maximum Operating Pressure: 175 psig
4. Maximum Continuous Operating Temperature: 225 deg F
5. Inlet and Outlet Size: 3 ft.
6. Impeller Size: 8.40 in.
7. Motor Speed: 1,760 RPM
8. Motor Horsepower: 5.00 hp
9. Electrical Characteristics:

a. Volts: 208 V.
b. Phase: Three
c. Hertz: 60 Hz.

2.3 INTEGRAL PUMP MOTOR VARIABLE-FREQUENCY CONTROLLERS

A. Where specified or scheduled, provide pumps with an integral variable-frequency pump motor speed controller.

1. Motor: Operates as constant- or variable-speed pump with speed regulated by an integrated variable-frequency drive.
2. Commissioning and pump set up access to pump controls via the following:

a. A user interface located on the face of variable-frequency controller to adjust modes and mode values.

3. Provide electronics with "Auto" as factory default but slope of the proportional curve will automatically match the required system curve, constant pressure control (delta-p/c), variable differential pressure control (delta-p/v), constant curve duty (uncontrolled pump), and rpm regulation. RPM (speed) regulation can be accomplished by the following:

   a. Manual, via user interface.
   b. Remote via 0 to 10 V dc.
   c. Data protocol communications with the BMS.

4. Pump Electronics: Standard with multiple digital inputs and one external digital output to be available for additional mechanical room control and pump status monitoring.
5. Controller: Mounted on or adjacent to the motor. Provide enclosure rated to UL Type 12.
6. Electronically Protected Pumps: Rated for continuous duty and with built-in startup circuit. Provide overcurrent, line surge and current limit protection, thermal monitoring, heat sink status and over temperature protection.
7. Integrated pump controller system to have the following features:

   a. Controller software to be capable of sensorless control in variable-volume systems without need for pump-mounted (internal/external) or remotely mounted differential pressure sensor.
   b. Integrated Pump Controller Sensorless Control: Operates under Quadratic Pressure Control (QPC) to ensure that head reduction with reducing flow conforms to quadratic control curve.
   c. Controller:

      1) Minimum head of 40 percent of design duty head.
      2) User-adjustable control mode settings and minimum/maximum head set points using built-in programming interface.

   d. Controller Integrated Control Software:

      1) Capable of controlling pump performance for non-overloading power at every point of operation.
      2) Capable of indicating flow rate data.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

B. Examine foundations and inertia bases for suitable conditions where pumps will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

A. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

B. Where required, independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

C. Equipment Mounting:

1. Install base-mounted pumps on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
3. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

3.3 ALIGNMENT

A. Perform alignment service.

B. Comply with requirements in HI standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.

C. Comply with pump and coupling manufacturers' written instructions.

D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.4 PIPING CONNECTIONS

A. Where installing piping adjacent to pump, allow space for service and maintenance.

B. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

C. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

D. Install check, shutoff, and throttling valves on discharge side of pumps.

E. Install suction diffuser and shutoff valve on suction side of pumps.

1. Use startup strainer for initial system startup. Install permanent strainer element before turnover of system to Owner.

F. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

G. Install pressure gauges on pump suction and discharge or at integral pressure-gauge tapping, or install single gauge with multiple-input selector valve.

3.5 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate to be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.6 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

3.7 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping. Use startup strainer for initial startup.
4. Perform the following startup checks for each pump before starting:

    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in correct direction.

5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
6. Start motor.
7. Open discharge valve slowly.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a service representative.

D. Hydronic pumps will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION 232123

SECTION 232500
WATER TREATMENT 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. This Section includes the following HVAC water-treatment systems:

1. Bypass chemical-feed equipment and controls.
2. Chemical treatment test equipment.
3. HVAC water-treatment chemicals.

1.3 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

B. TDS: Total dissolved solids.

C. UV: Ultraviolet.

1.4 PERFORMANCE REQUIREMENTS

A. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

C. Closed hydronic systems, including chilled water, shall have the following water qualities:

1. pH: Maintain a value within 9.0 to 10.5.
2. "P" Alkalinity: Maintain a value within 100 to 500 ppm.
3. Boron: Maintain a value within 100 to 200 ppm.
4. Soluble Copper: Maintain a maximum value of 0.20 ppm.
5. TDS: Maintain a maximum value of 10 ppm.
6. Ammonia: Maintain a maximum value of 20 ppm.
7. Free Caustic Alkalinity: Maintain a maximum value of 20 ppm.
8. Microbiological Limits:

a. Total Aerobic Plate Count: Maintain a maximum value of 1000 organisms/ml.
b. Total Anaerobic Plate Count: Maintain a maximum value of 100 organisms/ml.
c. Nitrate Reducers: Maintain a maximum value of 100 organisms/ml.
d. Sulfate Reducers: Maintain a maximum value of 0 organisms/ml.
e. Iron Bacteria: Maintain a maximum value of 0 organisms/ml.

D. Passivation for Galvanized Steel: For the first 60 days of operation.

1. pH: Maintain a value within 7 to 8.
2. Calcium Carbonate Hardness: Maintain a value within 100 to 300 ppm.
3. Calcium Carbonate Alkalinity: Maintain a value within 100 to 300 ppm.

1.5 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for the following products:

1. Bypass feeders.
2. Chemical solution tanks.
3. Injection pumps.
4. Chemical test equipment.
5. Chemical material safety data sheets.

B. Shop Drawings: Pretreatment and chemical treatment equipment showing tanks, maintenance space required, and piping connections to HVAC systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: Power and control wiring.

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.

C. Operation and Maintenance Data: For sensors, injection pumps, and controllers to include in emergency, operation, and maintenance manuals.

D. Other Informational Submittals:

1. Water Analysis: Illustrate water quality available at Project site.

1.6 QUALITY ASSURANCE

A. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 MAINTENANCE SERVICE

A. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion, scale formation, and biological growth for cooling, chilled-water piping, condenser-water piping and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion, and shall include the following:

1. Initial water analysis and HVAC water-treatment recommendations.
2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.
3. Periodic field service and consultation.
4. Customer report charts and log sheets.
5. Laboratory technical analysis.
6. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aqua-Chem, Inc.; Cleaver-Brooks Div.
2. Barclay Chemical Co.; Water Management, Inc.
3. Boland Trane Services
4. GE Betz.
5. GE Osmonics.
6. Metro Group. Inc. (The); Metropolitan Refining Div.

2.2 MANUAL CHEMICAL-FEED EQUIPMENT

A. Bypass Feeders: Steel, with corrosion-resistant exterior coating, minimum 3-1/2-inch fill opening in the top, and NPS 3/4 bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.

1. Capacity: 5 gal.
2. Minimum Working Pressure: 125 psig.

2.3 STAINLESS-STEEL PIPES AND FITTINGS

A. Stainless-Steel Tubing: Comply with ASTM A 269, Type 316.

B. Stainless-Steel Fittings: Complying with ASTM A 815/A 815M, Type 316, Grade WP-S.

C. Two-Piece, Full-Port, Stainless-Steel Ball Valves: ASTM A 351, Type 316 stainless-steel body; ASTM A 276, Type 316 stainless-steel stem and vented ball, carbon-filled TFE seats, threaded body design with adjustable stem packing, threaded ends, and 250-psig SWP and 600-psig CWP ratings.

2.4 CHEMICAL TREATMENT TEST EQUIPMENT

A. Test Kit: Manufacturer-recommended equipment and chemicals in a wall-mounting cabinet for testing pH, TDS, inhibitor, chloride, alkalinity, and hardness; sulfite and testable polymer tests for high-pressure boilers, and oxidizing biocide test for open cooling systems.

B. Corrosion Test-Coupon Assembly: Constructed of corrosive-resistant material, complete with piping, valves, and mild steel and copper coupons. Locate copper coupon downstream from mild steel coupon in the test-coupon assembly.

1. Provide a two-station rack for closed-loop systems.

2.5 CHEMICALS

A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment, and that can attain water quality specified in Part 1 "Performance Requirements" Article.

PART 3 - EXECUTION

3.1 WATER ANALYSIS

A. Perform an analysis of supply water to determine quality of water available at Project site.

3.2 INSTALLATION

A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.

B. Install seismic restraints for equipment and floor-mounting accessories and anchor to building structure. Refer to Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for seismic restraints.

C. Install water testing equipment on wall near water chemical application equipment.

D. Install interconnecting control wiring for chemical treatment controls and sensors.

E. Mount sensors and injectors in piping circuits.

F. Bypass Feeders: Install in closed hydronic systems, including chilled water, and equipped with the following:

1. Install bypass feeder in a bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
2. Install test-coupon assembly in bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
3. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.
4. Install a swing check on inlet after the isolation valve.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Dielectric fittings are specified in Division 23 Section "Common Work Results for HVAC."

D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Division 23 Section "General-Duty Valves for HVAC Piping."

E. Refer to Division 22 Section "Domestic Water Piping Specialties" for backflow preventers required in makeup water connections to potable-water systems.

F. Confirm applicable electrical requirements in Division 26 Sections for connecting electrical equipment.

G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. 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.

B. Tests and Inspections:

1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of HVAC systems' startup procedures.
4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
7. 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 test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
8. Repair leaks and defects with new materials and retest piping until no leaks exist.

C. Remove and replace malfunctioning units and retest as specified above.

D. At four-week intervals following Substantial Completion, perform separate water analyses on hydronic systems to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section. Submit written reports of water analysis advising Owner of changes necessary to adhere to Part 1 "Performance Requirements" Article.

E. Comply with ASTM D 3370 and with the following standards:

1. Silica: ASTM D 859.
2. Steam System: ASTM D 1066.
3. Acidity and Alkalinity: ASTM D 1067.
4. Iron: ASTM D 1068.
5. Water Hardness: ASTM D 1126.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

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. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.
7. Seismic-restraint devices.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Nonmetal Ducts" for fibrous-glass ducts, thermoset fiber-reinforced plastic ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
3. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

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:

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 and vibration isolation.

C. 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.

D. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

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 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. McGill AirFlow LLC.
b. SEMCO Incorporated.
c. Sheet Metal Connectors, Inc.
d. Spiral Manufacturing Co., Inc.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 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: G60.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.

4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
5. Shop-Applied Coating Color: Black.
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

G. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

H. 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.

2.4 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Johns Manville., Linacoustic RC
   b. Knauf Insulation.
   c. Owens Corning.
   d. Maximum Thermal Conductivity:
      1) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
      2) For 1” thickness, minimum R-value: 4.2 hr-ft^2-^{o}F/Btu
2. Minimum Acoustical Performance: Sound Absorption Coefficient at Frequency, per ASTM C423 and ASTM E795

Thk.	125	250	500	1000	2000	4000	NRC
1”	0.08	0.31	0.64	0.84	0.97	1.03	0.70

3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

   a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. 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, 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.

C. 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.

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg 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.

2.6 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 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. 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.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

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. Drawings indicate interior clear dimensions of all ductwork. Coordinate exterior dimensions as required for ducts designated to have interior linings.

C. Provide 1” thick duct liner where indicated on plans and within 20 ft of any fan or equipment.

D. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

E. Install round ducts in maximum practical lengths.

F. Install ducts with fewest possible joints.

G. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

H. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

I. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

J. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

K. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

L. 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.

M. 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.

N. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "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 for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, 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 thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches 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 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 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. New Ducts with a Pressure Class Higher Than or equal to 3-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.

   b. Existing Ducts to Remain part of fresh air intake system, exposed on roof: Test entire duct section

   c. Ductwork associated with Smoke Exhaust Systems: Test entire duct system.

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.
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 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

A. Fresh Air Intake Ducts and Supply Air Ducts:

1. Ducts Connected to Variable-Air-Volume Air-Handling Units :

a. Pressure Class: Positive 3-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: 3. -inch wg
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

B. Return Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.
b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

D. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

2. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Galvanized.

E. Liner:

1. Supply Air Ducts: Fibrous glass, Type I, 1” thick
2. Supply Fan Plenums: Fibrous glass, Type II,

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:
1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:
1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:
1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
   1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
   2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
   3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
   4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

   a. Velocity 1000 fpm or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm: Conical tap.
   c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 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. Barometric relief dampers.
3. Manual volume dampers.
4. Control dampers.
5. Fire dampers.
6. Ceiling radiation dampers.
7. Smoke dampers.
8. Combination fire and smoke dampers.
9. Corridor dampers.
10. Flange connectors.
11. Duct silencers.
12. Turning vanes.
13. Remote damper operators.
14. Duct-mounted access doors.
15. Flexible connectors.
16. Duct security bars.
17. Duct accessory hardware.

B. Related Requirements:

1. Section 233113 Metal Ducts
2. Section 233346 "Flexible Ducts" for insulated and non-insulated flexible ducts.
3. Section 233723 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details 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.

1.4 INFORMATIONAL SUBMITTALS

A. 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.

B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and 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. 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. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. 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 AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Pottorff.
4. Ruskin Company.
5. Buckley

B. Description: Gravity balanced.

C. Maximum Air Velocity: 1000 fpm.

D. Maximum System Pressure: up to 6”wc.

E. Frame: Hat-shaped, 0.063-inch-thick extruded aluminum, with welded corners or mechanically attached and mounting flange.

F. Blades: Multiple single-piece blades, center pivoted, or off-center pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum or 0.050-inch-thick aluminum sheet noncombustible, tear-resistant, neoprene-coated fiberglass with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene, mechanically locked.

I. Blade Axles:

1. Material: Galvanized, steel Stainless steel, or Aluminum.
2. Diameter: 0.20 inch min.

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: Front mounted in sleeve.
    a. Sleeve Thickness: 20 gage minimum.
    b. Sleeve Length: 6 inches minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Galvanized steel or Aluminum.
8. Screen Type: Bird. ½ x ½ max opening
9. 90-degree stops.

2.4 BAROMETRIC RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Pottorff.
4. Ruskin Company.
5. Buckley

B. Suitable for horizontal or vertical mounting.

C. Maximum Air Velocity: 1000 fpm.

D. Maximum System Pressure: upto 6-inch wg.

E. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel or 0.063-inch-thick extruded aluminum or 0.05-inch-thick stainless steel, with welded corners or mechanically attached and mounting flange.

F. Blades:

1. Multiple, 0.025-inch-thick, roll-formed aluminum or 0.050-inch-thick aluminum sheet.
2. Maximum Width: 6 inches.
3. Action: Parallel.
4. Balance: Gravity.
5. Eccentrically pivoted or Off-center pivoted.

G. Blade Seals: Neoprene.

H. Blade Axles: Galvanized steel, aluminum, or Stainless steel.

I. Tie Bars and Brackets:

1. Material: Aluminum or Galvanized steel.
2. Rattle free with 90-degree stop.

J. Return Spring: Adjustable tension.

K. Bearings: Synthetic, Stainless steel, Bronze.

L. Accessories:

1. Flange on intake.
2. Adjustment device to permit setting for varying differential static pressures.

2.5 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Flex-Tek Group.
b. McGill AirFlow LLC.
c. Nailor Industries Inc.
d. Pottorff.
e. Ruskin Company.
f. Vent Products Co., Inc.
g. Buckley

2. Standard leakage rating, with linkage outside airstream.

3. Suitable for horizontal or vertical applications.
4. Frames:

a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel or 0.05-inch-thick stainless steel.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized or Stainless-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel, Stainless or steel Nonferrous metal.
7. Bearings:

    a. Oil-impregnated bronze, Molded synthetic, Oil-impregnated stainless-steel sleeve.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. McGill AirFlow LLC.
    b. Nailor Industries Inc.
    c. Pottorff.
    d. Ruskin Company.
    e. Vent Products Co., Inc.

2. Standard leakage rating, with linkage outside airstream.

3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.
    e. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.

6. Blade Axles: Galvanized steel or Stainless steel.
7. Bearings:

    a. Oil-impregnated bronze, Molded synthetic, or Stainless-steel sleeve.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Aluminum.

C. Low-Leakage, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. McGill AirFlow LLC.
    b. Nailor Industries Inc.
    c. Pottorff.
    d. Ruskin Company.
    e. Vent Products Co., Inc.

2. Comply with AMCA 500-D testing for damper rating.
3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.
5. Frames:

    a. U or Angle shaped.
    b. 0.094-inch-thick, galvanized sheet steel or 0.05-inch-thick stainless steel.
    c. Mitered and welded corners.
    d. Flanges for attaching to walls and flangeless frames for installing in ducts.

6. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized or Stainless, roll-formed steel, 0.064 inch thick.

7. Blade Axles: Galvanized steel or Stainless steel.
8. Bearings:

    a. Oil-impregnated bronze, Molded synthetic, Oil-impregnated stainless-steel sleeve, Stainless-steel sleeve.
    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. Blade Seals: Neoprene.
10. Jamb Seals: Cambered stainless steel or aluminum.
11. Tie Bars and Brackets: Galvanized steel or Aluminum.
12. Accessories:

    a. Include locking device to hold single-blade dampers in a fixed position without vibration.

D. Low-Leakage, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. McGill AirFlow LLC.
    b. Nailor Industries Inc.
    c. Pottorff.

d. Ruskin Company.
e. Vent Products Co., Inc.

2. Comply with AMCA 500-D testing for damper rating.
3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.
5. Frames: U or Angle-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
6. Blades:

   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.
   d. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.

7. Blade Axles: Galvanized steel, Stainless steel.
8. Bearings:

   a. Oil-impregnated bronze, Molded synthetic, Oil-impregnated stainless-steel sleeve, Stainless-steel sleeve.
   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. Blade Seals: Neoprene.
10. Jamb Seals: Cambered stainless steel, aluminum.
11. Tie Bars and Brackets: Galvanized steel, Aluminum.
12. Accessories:

    a. Include locking device to hold single-blade dampers in a fixed position without vibration.

E. Jackshaft:

1. Size: 0.5-inch diameter min.
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.

F. 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.

2.6 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arrow United Industries.
2. Greenheck Fan Corporation.
3. McGill AirFlow LLC.
4. Nailor Industries Inc.
5. Pottorff.
6. Ruskin Company.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

1. U or Angle shaped.
2. 0.094-inch-thick, galvanized sheet steel or 0.05-inch-thick stainless steel.
3. Mitered and welded corners.

D. Blades:

1. Multiple blade with maximum blade width of 6 inches.
2. Parallel blade for non modulating application
3. Opposed-blade design for all modulating applications
4. Galvanized-steel, Stainless steel, Aluminum.
5. 0.064 inch thick single skin or 0.0747-inch-thick dual skin.
6. Blade Edging: Closed-cell neoprene.
7. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

E. Blade Axles: 1/2-inch-diameter; galvanized steel, or stainless steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:

1. Oil-impregnated bronze, Molded synthetic, Oil-impregnated, stainless-steel sleeve, or Stainless-steel sleeve.
2. 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.
3. Thrust bearings at each end of every blade.

2.7 CONTROL DAMPER ACTUATORS

A. Type: Motor operated, with or without gears, electric and electronic.

B. Voltage:

1. 24 V.
2. Actuator shall deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
3. Actuator shall function properly within a range of 85 to 120 percent of nameplate voltage.

C. Construction:

1. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
2. 100 up to 400 W: Gears ground steel, oil immersed, shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.
3. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

D. Field Adjustment:

1. Spring return actuators shall be easily switchable from fail open to fail closed in the field without replacement.
2. Provide gear-type actuators with an external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.

E. Two-Position Actuators: Single direction, spring return or reversing type.

F. Modulating Actuators:

1. Capable of stopping at all points across full range, and starting in either direction from any point in range.
2. Control Input Signal:

    a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position, and other input drives actuator to close position. No signal of either input remains in last position.
    b. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for zero- to 10- or 2- to 10-V dc and 4- to 20-mA signals.
    c. Pulse Width Modulation (PWM): Actuator drives to a specified position according to a pulse duration (length) of signal from a dry-contact closure, triac sink or source controller.
    d. Programmable Multi-Function: (Not Used)

        1) Control input, position feedback, and running time shall be factory or field programmable.
        2) Diagnostic feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
        3) Service data, including at a minimum, number of hours powered and number of hours in motion.

G. Position Feedback:

1. Equip where indicated, equip two-position actuators with limits switches or other positive means of a position indication signal for remote monitoring of open and close position.
2. Equip where indicated, equip modulating actuators with a position feedback through current or voltage signal for remote monitoring.
3. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

H. Fail-Safe:

1. Where indicated, provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
3. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.

I. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

J. Damper Attachment:

1. Unless otherwise required for damper interface, provide actuator designed to be directly coupled to damper shaft without need for connecting linkages.
2. Attach actuator to damper drive shaft in a way that ensures maximum transfer of power and torque without slippage.
3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

K. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

2.8 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arrow United Industries.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.
4. Pottorff.
5. Ruskin Company.
6. Ward Industries; a brand of Hart & Cooley, Inc.

B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades inside airstream for application in duct over 24” in height. Curtain type with blades outside airstream for ducts 24” or less in height. Multiple-blade type; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.138 inch upto 4 SF 0.39 over 4 SF inch thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.9 CEILING RADIATION DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aire Technologies.
2. Nailor Industries Inc.
3. Pottorff.
4. Prefco.
5. Ruskin Company.

B. General Requirements:

1. Labeled according to UL 555C by an NRTL.
2. Comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."

C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.

D. Blades: Galvanized sheet steel with refractory insulation.

E. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

F. Fire Rating: 1hr for applications in assemblies up to 1 ½ hr rating. 2hr for application in assemblies of up to 3hr

2.10 SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Pottorff.
4. Ruskin Company.

B. General Requirements: Label according to UL 555S by an NRTL.

C. Smoke Detector: Integral, factory wired for single-point connection. Except for NYC smoke detector shall be provided by the fire alarm contractor.

D. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded or mechanically attached corners and mounting flange.

E. Blades: Roll-formed, horizontal, overlapping, 0.063-inch- thick, galvanized sheet steel.

F. Leakage: Class I.

G. Rated pressure and velocity to exceed design airflow conditions.

H. Mounting Sleeve: Factory-installed, 0.05-inch- thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.

I. Damper Motors: Modulating or two-position action.

J. 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. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.

5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
7. Electrical Connection: 115 V, single phase, 60 Hz.

K. Accessories:

1. Auxiliary switches for signaling, fan control and position indication.
2. Test and reset switches, damper or remote mounted.
3. Manual damper testing by physically depressing the low temperature thermal disc from the inside of the damper sleeve and resetting the sensor from the exterior side of the damper sleeve.
4. Dual position blade indicator switch package shall connect directly to the blade axel for positive annunciation (interconnecting arms, wire-forms, or brackets shall not be accepted) and provide full open and full closed blade indication to a remote location.
5. Dual Position Indicator Switch Package: Shall connect directly to the blade axel for positive annunciation (interconnecting arms, wire-forms, or brackets shall not be accepted) and provide full open and full closed blade indication to a remote location.
6. Duct Smoke Detector: Factory mounted in the damper sleeve with interconnecting wiring from the damper actuator to the smoke detector enabling a single power connection point for easy field wiring.

2.11 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Fan Corporation.
2. Pottorff.
3. Ruskin Company.

B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 for assemblies upto 2 hour and 3 hr rating for assemblies over 1 1/2hours.

E. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners and mounting flange.

F. Primary heat responsive device set at 285 deg F, resettable.

G. Secondary heat closure device, set at 350 deg F, resettable.

H. Smoke Detector: Integral, factory wired for single-point connection.

I. Blades: Roll-formed, horizontal, interlocking, 0.063-inch- thick, galvanized sheet steel.

J. Leakage: Class I.

K. Rated pressure and velocity to exceed design airflow conditions.

L. Mounting Sleeve: Factory-installed, 0.039-inch- thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.

M. Master control panel for use in dynamic smoke-management systems.

N. Damper Motors: Modulating or two-position action.

O. 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. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
7. Electrical Connection: 115 V, single phase, 60 Hz.

P. Accessories:

A. DRS-30 Two-Temperature Fire Closure Device:

1. UL classified two-temperature device permits the damper to be re-opened after initial temperature closure allowing the damper to remain operable for smoke management purposes until the high temperature limit is reached.

2. Manual damper testing is permitted by physically depressing the low temperature thermal disc from the inside of the damper sleeve and resetting the sensor from the exterior side of the damper sleeve.

3. Dual position blade indicator switch package shall connect directly to the blade axel for positive annunciation (interconnecting arms, wire-forms, or brackets shall not be accepted) and provide full open and full closed blade indication to a remote location.

B. PI-50 Dual Position Indicator Switch Package: Shall connect directly to the blade axel for positive annunciation (interconnecting arms, wire-forms, or brackets shall not be accepted) and provide full open and full closed blade indication to a remote location.

C. Duct Smoke Detector: Factory mounted in the damper sleeve with interconnecting wiring from the damper actuator to the smoke detector enabling a single power connection point for easy field wiring.

2.12 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Hardcast, Inc.
4. Ward Industries; a brand 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.

2.13 DUCT SILENCERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Industrial Noise Control, Inc.
2. McGill AirFlow LLC.
3. Ruskin Company.
4. Vibro-Acoustics.
5. Industrial Acoustics

B. General Requirements:

1. Factory fabricated.
2. Fire-Performance Characteristics: Adhesives, sealants, packing materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Shape:

1. Rectangular straight with splitters or baffles.
2. Round straight with center bodies or pods.
3. Rectangular elbow with splitters or baffles.
4. Round elbow with center bodies or pods.
5. Rectangular transitional with splitters or baffles.

D. Rectangular Silencer Outer Casing: ASTM A 653/A 653M, G90 , galvanized sheet steel, 0.040 inch thick.

E. Round Silencer Outer Casing: ASTM A 653/A 653M, G90, galvanized sheet steel.

1. Sheet Metal Thickness for Units up to 24 Inches in Diameter: 0.034 inch thick.
2. Sheet Metal Thickness for Units 26 through 40 Inches in Diameter: 0.040 inch thick.
3. Sheet Metal Thickness for Units 42 through 52 Inches in Diameter: 0.05 inch thick.
4. Sheet Metal Thickness for Units 54 through 60 Inches in Diameter: 0.064 inch thick.

F. Inner Casing and Baffles: ASTM A 653/A 653M, G60 galvanized sheet metal, 0.034 inch thick, and with 1/8-inch-diameter perforations.

G. Special Construction:

1. Suitable for outdoor use.
2. High transmission loss to achieve STC 45.

H. Connection Sizes: Match connecting ductwork unless otherwise indicated.

I. Principal Sound-Absorbing Mechanism:

1. Controlled impedance membranes and broadly tuned resonators without absorptive media.
2. Dissipative or Film-lined type with fill material.

a. Fill Material: Inert and vermin-proof fibrous material, packed under not less than 15 percent compression and Moisture-proof nonfibrous material.
b. Erosion Barrier: Polymer bag enclosing fill, and heat sealed before assembly.

3. Lining: Fiberglas cloth.

J. Fabricate silencers to form rigid units that will not pulsate, vibrate, rattle, or otherwise react to system pressure variations. Do not use mechanical fasteners for unit assemblies.

1. Joints: Lock formed and sealed or continuously welded or flanged connections.
2. Suspended Units: Factory-installed suspension hooks or lugs attached to frame in quantities and spaced to prevent deflection or distortion.
3. Reinforcement: Cross or trapeze angles for rigid suspension.

K. Accessories:

1. Integral 1-1/2 3-hour fire damper with access door. Access door to be high transmission loss to match silencer.
2. Factory-installed end caps to prevent contamination during shipping.
3. Removable splitters.
4. Airflow measuring devices.

L. Source Quality Control: Test according to ASTM E 477.

1. Testingto be witnessed by Engineer.

2. Record acoustic ratings, including dynamic insertion loss and generated-noise power levels with an airflow of at least 2000-fpm face velocity.
3. Leak Test: Test units for airtightness at 200 percent of associated fan static pressure or 6-inch wg static pressure, whichever is greater.

M. Capacities and Characteristics:

1. Configuration: Straight or 90-degree elbow as indicated on plan
2. Shape: Rectangular or Round as indicated on plan
3. Attenuation Mechanism: Acoustical glass fiber with protective film liner.
4. Maximum Pressure Drop: 0.25-inch wg.
5. Casing:

    a. Attenuation: Standard.
    b. Outer Material: Galvanized steel.
    c. Inner Material: Galvanized steel.

6. Velocity Range: 500 fpm max.
7. End Connection: 1-inch slip joint or Flange.
8. Length: as per plan
9. Face Dimension:

    a. Width: as per plan
    b. Height: as per plan

10. Face Velocity: as per plan
11. Dynamic Insertion Loss: as per plan
12. Generated Noise: as per plan
13. Accessories:

    a. Access door.
    b. Birdscreen.

2.14 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aero-Dyne Sound Control Co.
2. CL WARD & Family Inc.
3. Ductmate Industries, Inc.
4. Duro Dyne Inc.
5. METALAIRE, Inc.
6. Ward Industries; a brand of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.15 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pottorff.
2. Ventfabrics, Inc.
3. Young Regulator Company.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Copper or Aluminum.

D. Cable: Steel.

E. Wall-Box Mounting: Recessed.

F. Wall-Box Cover-Plate Material: Stainless steel.

2.16 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Greenheck Fan Corporation.
4. McGill AirFlow LLC.
5. Nailor Industries Inc.
6. Pottorff.

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: 1-by-1-inchbutt or 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: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles for plenum applications.
d. Access Doors Larger Than 24 by 48 Inches: Four hinges or Continuous and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 3.0- to 8.0-inch wg.
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch-thick, fibrous-glass or polystyrene-foam board.

2.17 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M.
2. Ductmate Industries, Inc.
3. Flame Gard, Inc.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.

D. Fasteners: Carbon 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.

2.18 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. Elgen Manufacturing.

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 3-1/2 inches or 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. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd..
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.

1. Minimum Weight: 16 oz./sq. yd..
2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 oz./sq. yd..
2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.

2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.19 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. Compliance with ASHRAE/IESNA 90.1-2004 includes Section 6.4.3.3.3 - "Shutoff Damper Controls," restricts the use of backdraft dampers, and requires control dampers for certain applications. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.
3. Install stainless steel volume dampers in stainless steel ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers according to UL listing.

H. Connect ducts to duct silencers rigidly.

I. 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 from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot spacing and the bottom of all riser in Laundry exhaust ducts.
8. Upstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. 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.

L. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

P. Connect diffusers or light troffer boots to ducts with maximum 30-inch lengths of flexible duct clamped or strapped in place.

Q. Connect flexible ducts to metal ducts with draw bands.

R. Install duct test holes where required for testing and balancing purposes.

S. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 DAMPER INSTALLATION

3.3 CONTROL-DAMPER APPLICATIONS

A. Control Dampers:
   a. Use opposed blade type dampers for all modulating damper applications
   b. Use parallel blade type damper for all open closed applications.
   c. Damper actuation stroke time shall be adjustable
   d. Damper position feedback is required for all dampers that are part of a smoke purge or smoke control system.

3.4 INSTALLATION, GENERAL

A. Properly support dampers and actuators, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a force.

B. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

C. Seal penetrations made in fire-rated and acoustically rated assemblies.

D. Fastening Hardware:

   1. Stillson wrenches, pliers, or other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
   2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
   3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

E. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

F. Corrosive Environments:

   1. Use products that are suitable for environment to which they will be subjected.
   2. If possible, avoid or limit use of materials in corrosive environments, including, but not limited to, the following:

a. Laboratory exhaust airstreams.
b. Process exhaust airstreams.

3. Use Type 316 stainless-steel tubing and fittings when in contact with a corrosive environment.
4. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
5. Where actuators are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.5 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 23 3423
HVAC POWER VENTILATORS

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. Utility set fans.
2. Centrifugal roof ventilators.
3. Axial roof ventilators.
4. Centrifugal wall ventilators.
5. In-line centrifugal fans.
6. Propeller fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For unit hangars and supports 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. 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.
2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.

D. Coordination Drawings: Reflected ceiling 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. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

E. Field quality-control reports.

F. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, 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.

1.6 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.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: 2 set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 UTILITY SET FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ACME Company.
   2. Loren Cook Company.
   3. New York Blower Company
   4. PennBarry.
   5. Greenheck.

B. Housing: Fabricated of galvanized steel with side sheets fastened with a deep lock seam or welded to scroll sheets.

   1. Housing Discharge Arrangement: Adjustable to eight standard positions.

C. Fan Wheels: Single-width, single inlet; welded to cast-iron or cast-steel hub and spun-steel inlet cone, with hub keyed to shaft.

   1. Blade Materials: Steel or Aluminum.
   2. Blade Type: Backward inclined or Forward curved, or Airfoil. As scheduled
   3. Spark-Resistant Construction: AMCA 99, Type [A] [B] [C]

D. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

E. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L_{50} of 200,000 hours.

   1. Extend grease fitting to accessible location outside of unit.

F. Belt Drives:

   1. Factory mounted, with final alignment and belt adjustment made after installation
   2. Service Factor Based on Fan Motor Size: [1.5] [1.4] [1.3] [1.2]
   3. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
   4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
   5. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

G. Accessories:

   1. Inlet and Outlet: Flanged.
   2. Companion Flanges: Rolled flanges for duct connections of same material as housing.
   3. Backdraft Dampers: Gravity actuated with counterweight and interlocking aluminum blades with felt edges in steel frame installed on fan discharge.
   4. Access Door: Gasketed door in scroll with latch-type handles.
   5. Scroll Dampers: Single-blade damper installed at fan scroll top with adjustable linkage.
   6. Inlet Screens: Removable wire mesh.

7. Drain Connections: NPS 3/4 threaded coupling drain connection installed at lowest point of housing.
8. Weather Hoods: Weather resistant with stamped vents over motor and drive compartment.
9. Discharge Dampers: Assembly with opposed blades constructed of two plates formed around and to shaft, channel frame, sealed ball bearings, with blades linked outside of airstream to single control lever of same material as housing.
10. Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
11. Disconnect switch - Nonfusible type, with thermal-overload protection. Externally mounted outdoor disconnects shall be NEMA 3R

2.2 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ACME Company.
2. Central Blower Company.
3. Greenheck Fan Corporation.
4. Loren Cook Company.
5. PennBarry.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector (for kitchen hood applications).
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside or outside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
4. Barometric Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Special Considerations for Kitchen Hood Exhaust Applications:
   a. No back-draft discharge damper for kitchen hood exhaust applications
   b. Minimum curb Height: 12". Coordinate the exact curb height in the field so that the top of the fan is a minimum of 40" above the roof.
   c. Roof curb shall be vented without insulation.
   d. Provide grease drain line and cup
   e. Provide hinged fan
   f. NEMA 3R external unit mounted disconnect switch.
   g. Bird screen with heat baffle
   h. Fan shall be hinge mounted to curb for access to the wheel and ductwork
   i. UL 762 rated for continuous operation up to 300 deg F.

G. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

   1. Configuration: Self-flashing without a cant strip, with mounting flange.
   2. Minimum Height: 18 inches. For Kitchen exhaust applications coordinate the curb height in the field so that the top of the fan is a minimum of 40" above the roof.
   3. Sound Curb: Curb with sound-absorbing insulation.
   4. Pitch Mounting: Manufacture curb for roof slope.
   5. Metal Liner: Galvanized steel.
   6. Burglar Bars: 1/2-inch- thick steel bars welded in place to form 6-inch squares. (Not required unless scheduled)
   7. Mounting Pedestal: Galvanized steel with removable access panel.
   8. Vented Curb: Unlined with louvered vents in vertical sides. (for kitchen hood exhaust applications)

2.3 CENTRIFUGAL WALL VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Carnes Company.
   2. Greenheck Fan Corporation.
   3. ACME Fan Incorporated.
   4. Loren Cook Company.
   5. PennBarry.

B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; venturi inlet cone.

C. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

   1. Resiliently mounted to housing.
   2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
   3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
   4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
   5. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
4. Wall Grille: Ring type for flush mounting.
5. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in wall sleeve; factory set to close when fan stops.
6. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

2.4 IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carnes Company.
2. Greenheck Fan Corporation.
3. ACME Fan Incorporated.
4. Loren Cook Company.
5. PennBarry.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent. (where scheduled or indicated on plan)
2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
3. Companion Flanges: For inlet and outlet duct connections.
4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.
6. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside or outside fan housing, factory wired through an internal aluminum conduit

2.5 PROPELLER FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carnes Company.
2. Chicago Blower Corporation.
3. Loren Cook Company.
4. ACME
5. PennBarry.

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 or 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, L_{10} of 100,000 hours.

8. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
9. Motor Pulleys: Adjustable pitch for use with motors through 3 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. Accessories:

1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
3. Wall Sleeve: Galvanized steel to match fan and accessory size.
4. Weathershield Hood: Galvanized steel to match fan and accessory size.

5. Weathershield Front Guard: Galvanized steel with expanded metal screen.
6. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
7. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
8. alkali, and solvents. Coating system shall exceed 4000-hour ASTM B117 Salt Spray Resistance.
9. Note that 10-20 mil thick wet coating systems pollute the environment (air and water), and that these manually applied coatings are not uniform over the impeller surface and can cause fan imbalance and vibration.

H. If Project has more than one type or configuration of propeller fan, delete paragraph below and schedule fans on Drawings.

2.6 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 15 Section "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

B. Enclosure Type: Totally enclosed, fan cooled.

2.7 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to 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. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using spring isolators or restrained spring isolators for projects with seismic requirements having a static deflection of 1 inch. Vibration- and seismic-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

1. Secure vibration and seismic controls to concrete bases using anchor bolts cast in concrete base.

C. Install floor-mounted units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

D. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

E. Support suspended units from structure using threaded steel rods and elastomeric hangers or spring hangers with vertical-limit stops having a static deflection of 1 inch. Install units with clearances for service and maintenance.

F. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section "Air Duct Accessories."

B. Kitchen exhaust hood fans shall not have flexible connections or back draft dampers.

C. Install ducts adjacent to power ventilators to allow service and maintenance.

D. Prove flexible duct connections for all fans except Kitchen exhaust fans.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. 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. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

D. Comply with requirements in "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

E. Mechanical schedules and equipment notes indicate estimated static pressures and resultant RPM. If, during balancing, it is determined that the sheaves supplied with, and fan or air handling unit have reached the maximum adjustment and design static pressure and or CFM can not be obtained then it shall be the mechanical contractors responsibility to remove and change the drive as required to reach design conditions. And it shall be the balancers responsibility to rebalance the system as appropriate to achieve design conditions after the drives have been changed.

END OF SECTION

SECTION 235123
GAS VENTS

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. Listed double-wall vents.

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 product.

B. Shop Drawings: For vents.

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. Detail fabrication and assembly of hangers and seismic restraints.
4. Include draft calculations for the proposed installation to show compliance with heating equipment manufacturer’s requirements. Coordinate with new and existing heating equipment.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Sample Warranty: For special warranty.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for shop and field welding of joints and seams in vents.

B. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

PART 2 - PRODUCTS

2.1 LISTED SPECIAL GAS VENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Heat-Fab, Inc.
2. Metal-Fab, Inc., Corr/Guard II
3. Selkirk Corporation.
4. Security Chimneys: Secure Seal

B. Description: Double-wall metal vents tested according to UL 1738 and rated for 480 deg F continuously, with positive or negative flue pressure complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 1/2-inch airspace.

D. Inner Shell: ASTM A 959, Type AL29-4C stainless steel.

E. Outer Jacket: Aluminized steel or Stainless steel.

F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Listed Special Gas Vent: Condensing gas appliances.

3.3 INSTALLATION OF LISTED VENTS

A. Comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.

B. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.

C. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.

D. Lap joints in direction of flow.

3.4 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

END OF SECTION 235123

SECTION 235216
CONDENSING BOILERS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all high efficiency condensing boilers as indicated and scheduled on the drawings and in accordance with the Contract Documents.

B. Section includes:

1. Factory-fabricated and -assembled, gas-fired, firetube duplex alloy stainless steel ultra-high efficiency condensing boilers, trim and accessories for generating hot water.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section, including General and Supplementary Conditions and Division 01 Specification Sections.

1.3 SUBMITTALS

A. Product Data: Include performance data, operating characteristics, technical product data, rated capacities of selected model, weights (shipping, installed and operating), installation and start-up instructions, and furnished accessory information.

B. Shop Drawings: For boiler, standard boiler trim and accessories.

1. End Assembly Drawing: Detail overall dimensions, connection sizes, connection locations, and clearance requirements.

2. Wiring Diagrams: Detail electrical requirements for the boiler including ladder type wiring diagrams for power, interlock and control wiring. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.

C. Certificate of Product Rating: Submit AHRI Certificate indicating Thermal Efficiency, Combustion Efficiency, Materials of Construction, Input, and Gross Output conform to the design basis.

D. Thermal efficiency curves: Submit thermal efficiency curves between and including minimum and maximum rated capacities, for return water temperatures ranging from 80°F to 180°F.

E. Water side pressure drop curve.

F. Flue gas temperature curves: Submit flue gas temperature curves for minimum and maximum boiler capacity, for return water temperatures ranging from 80°F to 160°F.

G. If submitted flue gas temperatures, minimum or maximum inputs are different from that of the basis of design manufacturer and model, the manufacturer shall be responsible for draft calculations and reselection of the flue gas exhaust system.

H. Source quality-control test reports.

I. Field quality-control test reports: Start-up by a factory authorized service company.

J. Operation and Maintenance Data: Data to be included in Installation and Operation Manual.

K. Warranty: Standard warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms regularly engaged in the manufacture of condensing hydronic boilers with welded steel pressure vessels, whose products have been in satisfactory use in service for not less than twenty-five (25) years. The manufacturer must be privately owned and headquartered in North America. The specifying engineer, contractor and end customer must have the option to visit the factory during the manufacture of the boilers and be able to witness test fire and other relevant procedures.

B. Aftermarket Support and Service: The manufacturer shall have a factory authorized service training program, where boiler technicians can attend a training class and obtain certification to perform start-up, maintenance and basic troubleshooting specific to the product line.

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. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code, Section IV “Heating Boilers”, for a maximum allowable working pressure of 160 PSIG.

E. CSD-1 Compliance: The boiler shall comply with ASME Controls and Safety Devices for Automatically Fired Boilers (CSD-1).

F. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to “Gas and Oil Fired Boilers - Minimum Efficiency Requirements.”

G. Industrial Code Rule 4 Low Pressure Boilers Compliance: The boiler shall comply with 12 NYCRR, Chapter I, Subchapter A, Part 4 Low Pressure Boilers.

H. UL Compliance: Boilers must be tested for compliance with UL 795, “Commercial-Industrial Gas Heating Equipment.” Boilers shall be listed and labeled by ETL.

I. AHRI Compliance: Boilers shall be tested and rated according to the BTS-2000 test standard and verified by AHRI.

J. NOx Emissions Compliance: Boiler shall be tested for compliance with SCAQMD and TCEQ.

K. The equipment shall be of the type, design, and size that the manufacturer currently offers for sale and appears in the manufacturer’s current catalog.

L. The equipment shall fit within the allocated space, leaving ample allowance for maintenance and inspection.

M. The equipment shall be new and fabricated from new materials. The equipment shall be free from defects in materials and workmanship.

N. All units of the same classification shall be identical to the extent necessary to ensure interchangeability of parts, assemblies, accessories, and spare parts wherever possible.

O. In order to provide unit responsibility for the specified capacities, efficiencies, and performance, the boiler manufacturer shall certify in writing that the equipment being submitted shall perform as specified.

1.5 COORDINATION

A. Mechanical contractor shall coordinate the size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete reinforcement and formwork requirements are specified in Division 03.

1.6 WARRANTY

A. Standard Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period provided the boiler is installed, controlled, operated and maintained in accordance with the Installation, Operation and Maintenance Manual.

1. Warranty Period for the Pressure Vessel and Heat Exchanger: The boiler manufacturer shall warranty against failure due to:

a. Flue gas condensate corrosion, and/or defective material or workmanship for a period of ten (10) years, non-prorated, from the date of shipment from the factory.

b. Thermal shock for the lifetime of the boiler.

2. Warranty Period for the Burner: The boiler manufacturer shall warranty the mesh burner head against defective material or workmanship for a period of five (5) years, non-prorated, from the date of shipment from the factory.

3. Warranty Period for all other components: The boiler manufacturer will repair or replace any part of the boiler that is found to be defective in workmanship or material for a period of two (2) years, non-prorated, from the date of shipment from the factory.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fulton Heating Solutions, Inc.

2. Aerco International

3. Engineer Approved Equal.

a. Alternate boilers must equal or exceed all aspects of this specification in its entirety throughout. Boilers seeking an approval shall provide documentation that supports this requirement.

B. For manufacturers other than Basis-of-Design: All costs associated with system design changes, including redesign, additional components, coordination and costs borne by other trades, engineering drawings, and filings with the local building department shall be borne entirely by the installing mechanical contractor.

C. Manufacturer and their local Sales and Support agent shall have a minimum of 15 years' experience in the design, manufacture, and operation of condensing, modulating boiler systems. Alternate manufacturers shall provide a reference list with a minimum of 5 similar installations that have been in continuous use for 5 or more years, contact name and phone number, and model of equipment provided.

D. Single Source Responsibility: Additional equipment specified herein including boiler sequencers, motorized isolation valves and controls, draft controls and sensors, interlock controllers, communication equipment, and Life Safety Panels and sensors shall be provided by, and are the responsibility of the boiler manufacturer and boiler system startup supplier.

2.2 FIRETUBE BOILER CONSTRUCTION

A. Description: Factory-fabricated, -assembled, and -pressure tested, duplex stainless steel firetube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including flue gas vent; combustion air intake connections, water supply, water return, condensate drain, and controls. The boiler, burner and controls shall be completely factory assembled as a self-contained unit. Each boiler shall be neatly finished, thoroughly tested, and properly packaged for shipping. Closed-loop water heating service only.

B. Heat Exchanger: The heat exchanger is defined as the surfaces of the pressure vessel where flue gases transfer sensible and latent heat to the hydronic fluid. The heat exchanger shall be a three-pass firetube design constructed using only duplex alloys of stainless steel.

1. The boiler shall be a firetube design, such that all combustion chamber components are within water-backed areas. Watertube boilers will not be accepted.

2. Furnace to tube connections shall be constructed with low weld intensity, a tube to tube minimum spacing of 2" center to center, minimum 5/8" tube to tube ligament, and shall not contain any overlapping welds.

3. Heat exchange capability shall be maximized within the heat exchanger via the use of corrugated firetube technology. The corrugation process shall not remove any material from the tubes. Aluminum heat transfer enhancements are dissimilar metals and are unacceptable.

4. Material: The heat exchanger shall have the following material characteristics and properties:

a. The metallic crystalline lattice microstructure shall contain approximately equal amounts of body center cubic (BCC) and face centered cubic (FCC) structures to offer high resistance to intergranular corrosion.

b. A minimum Pitting Resistance Equivalent Number (PREN) of 26.

c. A minimum Yield Strength of 65 ksi at 0.2% plastic strain.

d. A minimum Ultimate Tensile Strength of 94 ksi.

e. To minimize stresses caused by uneven expansion and contraction, the Coefficient of Thermal Expansion at 212°F shall not be less than 7.0 in/in °F 10-6 and shall not be greater than 7.5 in/in °F 10-6.

f. To increase resistance to pitting and crevice corrosion, the Chromium content shall not be less than 21% by mass.

g. For high mechanical strength, the Nitrogen content shall not be less than 0.17% by mass.

h. Boilers with heat exchangers constructed of austenitic stainless steels, such as 316L or 304, and ferritic stainless steels, such as 439, are unacceptable.

i. Boilers with heat exchangers constructed of cast aluminum, mild steel, cast iron or copper finned tube materials are unacceptable.

C. Exhaust manifold shall be minimum 0.5” thick stainless steel, ASME designation SA-351 CF3M, and shall be a water-backed design to enhance heat transfer. Dry-back style flue gas condensate collection pan exhaust manifolds are not accepted.

D. Pressure Vessel: Design and construction shall be in accordance with Section IV of the ASME Code for heating boilers.

1. The shell shall be minimum 0.3125” thick steel, SA-790 or SA-516 Grade 70.

2. The top head shall be a minimum 0.375” thick steel, SA-790 or SA-516 Grade 70.

3. The water side of the pressure vessel shall be a counter-flow design with internal water-baffling plates.

4. The boiler return and supply water connections shall be 150# ANSI flanged. The water connections shall not be designed to support an external structural load from the piping system.

5. The water volume of the boiler shall not be less than 80 Gallons.

   a. For boilers with a lower water volume, the boiler manufacturer shall provide a buffer tank and all associated buffer tank ancillaries to make equivalent to the total volume of the design basis.

6. The maximum water pressure drop across the boiler inlet and outlet connections, shall not exceed 3.0 PSID at 235 GPM.

E. Fuel/Air Mixture Combustion System: Air and gas pre-mix on the suction side of the fan.

1. A Flame-by-Wire™ or equivalent electronic combustion control system shall be provided to empower technicians to accurately dial-in positions electronically. The system shall feature O2 Compensation™ or equivalent to continuously tune the burner air-fuel ratio in real time, automatically adjusting for changes in seasonality to maximize combustion efficiency and condensate production for greater energy savings and reduced emissions. Pneumatic ("negative regulation", "zero governor") type systems offer far less precision and are not capable of independent air and gas control and are not accepted.

2. The air and gas tolerance shall be no greater than +/- 0.2° to allow for much more precise control of air-fuel ratio compared to linkages that may slip, or pneumatic gas valves which drift over time and have difficulty handling environmental and installation fluctuations.

a. Combustion air flow shall be controlled by fan speed and a servo-motor actuated butterfly valve. Fuel flow shall be controlled by a servo-motor actuated butterfly valve.

3. PURE Control™ algorithms with open-loop instrumentation shall be used for autonomous fuel/air ratio tuning without requiring manual input. O2 feedback or monitoring-only systems cannot adjust for operation variability and are not accepted.

F. Burner: Standard natural gas, forced draft.

1. Burner Head: Shall be a woven fiber premix design.

2. Excess Air: The burner shall operate at no greater than 8.0% excess O2 over the entire turndown range. Due to significant reductions in combustion efficiency at high levels of excess O2, boilers exceeding 8.0% excess O2 at any operating condition shall not be accepted.

3. Emissions: When operating on natural gas, the boiler shall maintain a NOx level of <20 ppm, and CO emissions less than 50 ppm, over the complete combustion range at a 3% O2 correction.

G. Blower: Variable speed, non sparking, hardened aluminum impeller centrifugal fan to operate during each burner firing sequence and to pre-purge and post-purge the combustion chamber.

1. Motor: Totally enclosed fan-cooled premium efficiency AC motor, Class H insulation, variable speed capable with sealed bearings.

2. Variable speed drive: IP20 housing, 0-400Hz frequency output capability, overload capacity of 150% for 60 seconds and 200% for 3 seconds, shall fully modulate fan speed according to burner input requirements.

3. Motor Alternate: Brushless DC variable speed motor with hall effect sensor feedback; internal electronic commutation controller with built in speed control and protection features; long life, sealed, ball bearing with high temperature grease.

4. Variable speed blower: Closed loop PWM signal input with tachometer output.

H. Main Fuel Train:

1. A factory mounted main fuel train shall be supplied. The fuel train shall be fully assembled complete with high and low gas pressure switches, wired, and installed on the boiler and shall comply with CSD-1 code. The fuel train components shall be enclosed within the boiler cabinet.

I. Ignition: Direct spark ignition with transformer. A UV scanner shall be utilized to ensure precise communication of flame status back to the flame programmer. Flame rods are not accepted.

J. Boiler Enclosure:

1. Sealed Cabinet: Jacketed steel enclosure with left hinged full height front access door, fully removable latching access panels, gasketed seams to maintain sealed combustion, mounted on a steel skid with steel plate decking.

2. Control Enclosure: NEMA 250, Type 1.

3. Finish: Internally and externally primed and painted or powder coated.

4. Combustion Air: Drawn from the inside of the sealed cabinet, preheating the combustion air. Factory mounted air filter directly coupled to the blower inlet.

K. Rigging and Placement: The boiler shall come with lifting eyes and fork hole accessibility for rigging.

L. Characteristics and Capacities:

1. Heating Medium: Closed loop hot water with up to 50% propylene or ethylene glycol by volume. Standard capacities shall be based on 100% water.

2. Design Water Pressure Rating: 160 psig.

3. Factory Supplied ASME Safety Relief Valve.

4. Minimum Return Water Temperature: No minimum temperature required.

5. Maximum Allowable Water Temperature: 210°F.

6. Minimum Water Flow Rate:

a. EDR: No minimum flow rate required to protect the heat exchanger.

b. EDR+2500: 25 gpm.

7. Maximum Water Flow Rate: No maximum flow rate requirement.

8. Minimum Delta-T: No minimum delta-T required.

9. Maximum Delta-T: 100°F

10. Minimum Side Clearance: Shall not exceed 1” between any number of boilers.

11. Maximum Allowable Operating Setpoint: 200°F

12. Jacket Losses: External convection and radiation heat losses to the boiler room from the boiler shall comply with IAW ASHRAE 103-2007, and shall not exceed 0.2% of the rated boiler input at maximum capacity.

M. The boiler shall have its efficiency witnessed and certified by an independent third party, and the efficiency must be listed on the AHRI directory (www.ahridirectory.org) for natural gas operation. The test parameters for efficiency certification shall be the BTS-2000 standard.

N. Flow switches, dedicated circulator pumps, or primary-secondary arrangements shall not be required to protect the boiler from thermal shock. Boilers requiring the use of flow switches or primary-secondary piping arrangements are unacceptable.

O. The equipment shall be in strict compliance with the requirements of this specification and shall be the manufacturer's standard commercial product unless specified otherwise. Additional equipment features, details, accessories, etc. which are not specifically identified but which are a part of the manufacturer's standard commercial product, shall be included in the equipment being furnished.

2.3 TRIM

A. Safety Relief Valve: ASME Rated.

B. Pressure and Temperature Gauge: Minimum 3-1/2" diameter, combination pressure and -temperature gauge. Gauges shall have operating-pressure and -temperature ranges so normal operating range is about 50 percent of full range.

1. Mounted in the field in the boiler supply water piping prior to the first isolation valve by the boiler installer.

C. Combustion Air Inlet Filter: 50 Micron.

D. Flue Gas Condensate Drain Trap: A flue gas condensate drain trap shall be provided to prevent positive pressure exhaust gases from entering the boiler room.

E. Flue Gas Condensate Neutralization: pH neutralization accommodations available upon request.

2.4 CONTROLS

A. Refer to Division 23, Section "Instrumentation and Control of HVAC."

B. The boiler electrical controls shall include the following devices and features:

1. 7" color touch screen control display factory mounted on the front cabinet panel door.

a. The control display shall serve as a user interface for programming parameters, boiler control and monitoring; and shall feature a screen saver, alarm horn speaker, boiler status, configuration, history and diagnostics.

2. Integral controls power supply.

3. Flame safeguard control with 9 combustion fuel/air load profile points.

4. All standard controls shall be factory mounted and wired according to UL requirements.

C. Burner Operating Controls: To maintain safe operating conditions, factory mounted and wired burner safety controls limit burner operation:

1. High Limit: A manual reset mechanical Aquastat device shall stop the burner if operating conditions rise above maximum boiler design temperature.

2. Low-Water Cut Off: Electronic probe type mounted in the pressure vessel shall prevent burner operation on low water alarm.

3. Air Safety Switch: Prevent operation unless sufficient combustion air is proven.

4. Blocked Exhaust: Prevent operation in the event of a blocked flue gas exhaust stack.

D. O2 Compensation: To maximize efficiency throughout seasonality:

1. System shall use algorithms to automatically adjust the fuel/air ratio during operation, optimizing combustion reliability, flame stability, combustion efficiency, and the dewpoint temperature for formation of flue gas condensate.

2. O2 monitoring-only type systems that cannot automatically adjust combustion for seasonal variability shall not be accepted. Systems that trim but at less than a 100% duty cycle are unable to cope with rapid changes in operating conditions and shall not be accepted.

E. Boiler Operating Controls and Features:

1. Inlet Water Temperature Monitoring.

2. Combustion Air Temperature Monitoring.

3. Flue Gas Exhaust Temperature Monitoring: Sensor probe shall be stainless steel.

4. Proportional Integral Derivative (PID) temperature load control capability for hydronic and domestic hot water in standalone or lead/lag operation.

5. Operating temperature sensor for automatic start and stop.

   a. The temperature sensor shall have tolerance according to IEC 60751

6. Time of day display.

7. Customizable boiler name display.

8. Two customizable boiler interlock terminals displayed.

9. Alarm history for a minimum 100 most recent alarms including status at time of lockout.

10. Administrative password protection options.

11. Indirect domestic hot water priority.

12. [Optional:] Outdoor air temperature (OAT) reset controls with warm weather shutdown:

    a. OAT reset shall automatically adjust the setpoint according to changes in the outdoor temperature, and disable the boilers above a warm weather shutdown temperature.

    b. The boiler manufacturer shall provide an OAT sensor.

    c. The temperature sensor shall be field installed in an outdoor area not exposed to direct sunlight or the exhaust of other mechanical equipment, and wired the boiler controller.

    d. The control shall be field programmed with the outdoor reset schedule.

13. Variable Speed System (Secondary) Pump Control:

    a. When installed in a variable primary flow configuration, the boiler controller shall provide the capability to control two variable speed hydronic heating pumps. One pump shall be duty, and one standby.

    b. The duty system pump shall be enabled upon the outdoor air temperature dropping below the warm weather shutdown temperature. Pumps shall be automatically rotated.

    c. Variable speed signal shall be provided to modulate pump speed according to hydronic heating loop Delta-T. A user selectable parameter allows for Delta-P in place of Delta-T.

14. Motorized isolation valve control:

    a. Upon heat demand for the boiler, the control shall provide an enable/open signal.

    b. After the burner is disabled and upon the heat exchanger delta-T dropping to a user programmable delta-T, the signal will be disabled.

        1) Boilers which utilize only a time delay close as the only means of valve actuation are unable to optimize for residual heat, and will not be accepted.

    c. In variable primary arrangements, the control shall hold the lead boiler isolation valve open at all times.

F. Lead/Lag Control of Modular (Multiple) Boiler Plants: Lead/Lag capabilities shall be integral to the boiler controller for up to 10 boilers installed in the same hydronic loop and shall not require an external panel.

1. The boiler manufacturer shall provide a supply water header temperature sensor.

    a. The temperature sensor shall have tolerance according to IEC 60751, field installed in the common supply water piping.

2. Lead/lag operation shall not require a master boiler or external control panel. Field wired sensors or communication may be connected to any boiler in the lead/lag sequence.

3. The boilers shall communicate with each other via a private Ethernet/IP addressed network.

   a. Field wiring between boilers shall be shielded Cat5e or Cat6 Ethernet cable.

   b. In the event a communication cable becomes damaged or interrupted, communication shall be lost with only one boiler and not the entire lead/lag operation. Daisy chain style wiring lacks this redundancy and shall not be accepted.

4. Sequence of Operation:

   a. Upon loop temperature dropping below start point, the lead boiler shall be enabled at low fire and shall modulate according to the heating demand.

   b. Lag boiler stages are enabled according to heating demand. Boilers shall modulate in parallel as a cohesive unit according to heating demand.

   c. When all available boilers are active they may modulate in parallel up to full fire according to the heating demand.

   d. As heating demand decreases, the sequence shall operate in reverse.

   e. Rotation of the lead and subsequent lag boilers shall be automatic.

G. Building Automation System Interface: Hardware and software to enable building automation system (BAS) to monitor, control, and display boiler status and alarms.

1. Hardwired Contacts:

   a. Monitoring: Boiler Status, Burner Demand, General Alarm.

   b. Control with Factory Installed Jumper: Safety Interlock for External Device, Remote Enable, Emergency Stop (E-Stop).

   c. Remote Setpoint Signal: 4-20 mA or 0-10 VDC.

2. Communication Protocol: A communication interface with BAS shall enable BAS operator to remotely enable and monitor the boiler plant from an operator workstation.

   a. The boilers will communicate with each other and the Building Automation System via a daisy chain addressed Modbus network. Field wiring between nodes shall be twisted pair low voltage with shielded ground.

   b. [Optional Device:] A BACnet MSTP and IP protocol communication gateway shall be provided. The BACnet gateway is field installed on a boiler. Additional boilers in the lead/lag system shall not require a dedicated BACnet gateway for the BAS to monitor status. A communication point mapping list shall be provided.

   c. [Optional Device:] A LonWorks protocol communication gateway shall be provided. The LonWorks gateway is field installed on a boiler. Additional boilers in

the lead/lag system shall not require a dedicated LonWorks gateway for the BAS to monitor status. A communication point mapping list shall be provided.

2.5 ELECTRICAL POWER

A. Single-Point Field Power Connection: Factory-installed and factory-wired switches, transformers, control and safety devices and other devices shall provide a single-point field power connection to the boiler.

B. EDR Electrical Characteristics:

1. Voltage: 120 V.

2. Phase: Single.

3. Frequency: 60 Hz.

C. EDR+ Electrical Characteristics:

1. Voltage: 460 V.

2. Phase: Three.

3. Frequency: 60 Hz.

2.6 VENTING

A. The boiler shall be capable of operating with a stack effect not exceeding -0.04” W.C. and a combined air intake and exhaust venting pressure drop not exceeding +1.50” W.C.

B. Combustion Air Intake: It shall be acceptable to either direct vent the boiler using sealed combustion by drawing combustion air in from the outdoors or by drawing air from the mechanical space itself.

1. Sealed Combustion: Schedule 40 PVC pipe or smooth-walled galvanized steel, vent termination with 1/2” x 1/2” mesh bird screen.

2. Mechanical Space: Adequate combustion air and ventilation shall be supplied to the boiler room in accordance with local codes.

C. Flue Gas Exhaust: The flue gas exhaust stack shall be AL 29-4C or 316L stainless steel, listed and labeled to UL-1738 / C-UL S636 for use with Category II/IV appliances, guaranteed appropriate for the application by the manufacturer and supplier of the venting.

D. [Optional Method:] Common Exhaust Vents: The draft system shall be designed for Category II and to prevent the backflow of exhaust gases through idle boilers.

E. Condensate drain piping must be galvanized, stainless steel, or Schedule 40 CPVC. Copper, carbon steel, or PVC pipe materials are not accepted.

2.7 SOURCE QUALITY CONTROL

A. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

B. Each boiler shall be installed and operated in a functioning hydronic system, inclusive of venting, as part of the manufacturing process. A factory test fire report corresponding to the boiler configuration shall be included with each boiler.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.

1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where boilers will be installed.

C. Proceed with installation only after satisfactory conditions have been verified.

3.2 BOILER INSTALLATION

A. Install boilers level on concrete base, minimum 4 inches high. Concrete base is specified in Division 23 Section “Common Work Results for HVAC,” and concrete materials and installation requirements are specified in Division 03.

B. Install gas-fired boilers according to NFPA 54. Equipment and materials shall be installed in an approved manner and in accordance with the boiler manufacturer’s installation requirements.

C. Assemble and install boiler trim.

D. Install electrical devices furnished with the boiler but not specified to be factory mounted.

E. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

C. Connect gas piping to boiler gas train inlet with isolation valve and union. Piping shall be at least full size of gas train connection. Provide a reducer if required.

D. Connect hot water supply and return water connections with shutoff valve and union or flange at each connection.

E. Install piping from safety relief valves to the nearest floor drain.

F. Install piping from flue gas condensate drain connection to the condensate drain trap and to the nearest floor drain.

G. Boiler Venting:

1. Install flue venting and combustion air-intake.

2. Connect to boiler connections, flue size and type as recommended by the manufacturer.

H. Ground equipment according to Division 26 Section “Grounding and Bonding for Electrical Systems.”

I. Connect wiring according to Division 26 Section “Low-Voltage Electrical Power Conductors and Cables.”

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. After boiler installation is completed, the manufacturer shall provide the services of a field representative to inspect components, assemblies, and equipment installations, including connections and provide startup of the boiler and training to the operator.

2. Arrange with National Board of Boiler and Pressure Vessel Inspectors for inspection of boilers and piping. Obtain certification for completed boiler units, deliver to Owner, and obtain receipt.

B. Tests and inspections:

1. Perform installation and startup checks according to manufacturer’s written instructions.

2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.

3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.

a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.

b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Remove and replace malfunctioning units and retest as specified above.

D. Occupancy Adjustments: When requested within 12 months of startup, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to 2 visits to Project during other than normal occupancy hours for this purpose.

END OF SECTION 235216

SECTION 237313
OUTDOOR AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Variable-air-volume rooftop air-handling units. (AHU-1,2&3)

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design vibration isolation and seismic-restraint details, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Wind-Restraint Performance:

   1. Basic Wind Speed: 107
   2. Building Classification Category: III
   3. Minimum 10 lb/sq. ft multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

C. Structural Performance: Casing panels shall be self-supporting and capable of withstanding 133 percent of internal static pressures indicated, without panel joints exceeding a deflection of L/100 where "L" is the unsupported span length within completed casings.

1.4 QUALITY ASSURANCE

A. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with current AHRI Standard 410.

B. Air handling units shall be rated in accordance with AHRI Standard 430 for airflow, static pressure, and fan speed performance.

1.5 SUBMITTALS

A. Product Data: For each air-handling unit indicated.

1. Unit dimensions, weight, lift points, unit shipping split locations and dimensions, installation and operating weights, and installation, operation and service clearances.
2. All electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations.
3.
4. Cabinet material, metal thickness, finishes, insulation, and accessories.
5. Fans:

    a. Certified fan-performance curves with system operating conditions indicated.
    b. Certified fan-sound power ratings.
    c. Fan construction and accessories.
    d. Motor ratings, electrical characteristics, and motor accessories.

6. Certified coil-performance ratings with system operating conditions indicated.
7. Dampers, including housings, linkages, and operators.
8. Filters with performance characteristics.
9. All performance data, including capacities and airside and waterside pressure drops, for components.
10. Fan curves shall be provided for fans, with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes.
11. For any units utilizing multiple fans in a fan section, a fan curve shall be provided showing the performance of the entire bank of fans at design conditions. In addition, a fan curve shall be provided showing the performance of each individual fan in the bank of fans at design conditions. Also a fan curve shall be provided showing the performance of the bank of fans, if one fan is down. The percent redundancy of the bank of fans with one fan down shall be noted on the fan curve or in the tabulated fan data.
12. A filter schedule must be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, unit size, corresponding filter section location within the AHU, filter arrangement (e.g. angled/flat), filter depth, filter type (e.g. pleated media), MERV rating, and filter quantity and size.
13. A schedule detailing necessary trap height shall be provided for each air handling unit. Schedule shall detail unit tag, unit size, appropriate trap schematic with recommended trap dimensions, and unit supplied base rail height. Contractor shall be responsible for additional trap height required for trapping and insulation beyond the unit supplied base rail height by adequate housekeeping pad.
14. An electrical MCA - MOP schedule shall be provided for each electrical circuit to which field-power must be supplied. Schedule to detail unit tag, circuit description, voltage/phase/hertz, Minimum Circuit Ampacity (MCA), and calculated Maximum Overcurrent Protection (MOP).
15. Sound data shall be provided using AHRI 260 test methods. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, 4000 and 8000 Hz.

B. Delegated-Design Submittal: For vibration isolation 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. 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.

2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.

C. Coordination Drawings: Floor 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. Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.
2. Support location, type, and weight.
3. Field measurements.

D. Manufacturer Wind Loading Qualification Certification: Submit certification that specified equipment will withstand wind forces identified 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 calculations.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of wind force and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Source quality-control reports.

F. Field quality-control reports.

G. Operation and Maintenance Data: For air-handling units to include in emergency, operation, and maintenance manuals.

1.6 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. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

E. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

F. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate sizes and locations of structural-steel support members, if any, with actual equipment provided.

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. Filters: One set(s) for each air-handling unit.
2. Gaskets: One set(s) for each access door.
3. Fan Belts: One set(s) for each air-handling unit fan.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or comparable product by one of the following:
1. Trane; American Standard Inc.
2. Carrier
3. Johnson Controls/YORK International Corporation.

2.2 UNIT CASINGS

A. General Fabrication Requirements for Casings:

1. Forming: Form walls, roofs, and floors with at least two breaks at each joint.
2. Casing Joints: Sheet metal screws or pop rivets.
3. Sealing: Seal all joints with water-resistant sealant.
4. Factory Finish for Galvanized-Steel Casings: Apply manufacturer's standard primer immediately after cleaning and pretreating.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

B. Double-Wall Construction: Fill space between walls with 2-inch foam insulation and seal moisture tight for R-13 performance.

C. 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.

1. Exterior Casing Thickness: 0.0626 inch thick.

D. Casing Insulation and Adhesive:

1. Materials: ASTM C 1071, Type I.
2. Location and Application: Factory applied with adhesive and mechanical fasteners to the internal surface of section panels downstream from, and including, the cooling-coil section.

    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.

3. Location and Application: Encased between outside and inside casing.

E. Inspection and Access Panels and Access Doors:

1. Panel and Door Fabrication: Formed and reinforced, single- or double-wall and insulated panels of same materials and thicknesses as casing.
2. Inspection and Access Panels:

    a. Fasteners: Two or more camlock type for panel lift-out operation. Arrangement shall allow panels to be opened against air-pressure differential.
    b. Gasket: Neoprene, applied around entire perimeters of panel frames.
    c. Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.

3. Access Doors:

    a. Hinges: A minimum of two ball-bearing hinges or stainless-steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against air-pressure differential.
    b. Gasket: Neoprene, applied around entire perimeters of panel frames.
    c. Fabricate windows in fan section doors of double-glazed, wire-reinforced safety glass with an air space between panes and sealed with interior and exterior rubber seals.
    d. Size: At least 18 inches wide by full height of unit casing up to a maximum height of 60 inches.

4. Locations and Applications:

    a. Fan Section: Doors.
    b. Access Section: Doors.
    c. Coil Section: Inspection and access panel.
    d. Damper Section: Inspection and access panels.
    e. Filter Section: Inspection and access panels large enough to allow periodic removal and installation of filters.
    f. Mixing Section: Doors.
    g. Humidifier Section: Doors.

5. Provide a piping vestibule casing component adjacent to each coil section. Minimum size is 24” x width of coil section. Piping vestibule shall have an access door on one side.

6. Service Light: 100-W vaporproof fixture with switched junction box located outside adjacent to door.

    a. Locations: Fan section.

F. Condensate Drain Pans:

1. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and from humidifiers and to direct water toward drain connection.

    a. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1-2004.
    b. Depth: A minimum of 2 inches deep.

2. Formed sections.
3. Single-wall, stainless-steel sheet.
4. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on both ends of pan.

    a. Minimum Connection Size: NPS 1.

5. Pan-Top Surface Coating: Asphaltic waterproofing compound.
6. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

G. Air-Handling-Unit Mounting Frame: Formed galvanized-steel channel or structural channel supports, designed for low deflection, welded with integral lifting lugs.

2.3 FAN, DRIVE, AND MOTOR SECTION

A. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum-rated fan speed and motor horsepower.

1. Shafts: Designed for continuous operation at maximum-rated fan speed and motor horsepower, and with field-adjustable alignment.

    a. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
    b. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

B. Centrifugal Fan Housings: Formed- and reinforced-steel panels to form curved scroll housings with shaped cutoff and spun-metal inlet bell.

1. Bracing: Steel angle or channel supports for mounting and supporting fan scroll, wheel, motor, and accessories.

2. Horizontal-Flanged, Split Housing: Bolted construction.
3. Housing for Supply Fan: Attach housing to fan-section casing with metal-edged flexible duct connector.
4. Flexible Connector: Factory fabricated with a fabric strip 5-3/4 inches wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized-steel sheet or 0.032-inch- thick aluminum sheets; select metal compatible with casing.

    a. Flexible Connector Fabric: Glass fabric, double coated with neoprene. Fabrics, coatings, and adhesives shall comply with UL 181, Class 1.

        1) Fabric Minimum Weight: 26 oz./sq. yd..
        2) Fabric Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
        3) Fabric Service Temperature: Minus 40 to plus 200 deg F.

C. Plenum Fan Housings: Steel frame and panel; fabricated without fan scroll and volute housing.

D. Backward-Inclined, Centrifugal Fan Wheels: Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange, backplate, backward-inclined blades welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.

E. Forward-Curved, Centrifugal Fan Wheels: Inlet flange, backplate, and shallow blades with inlet and tip curved forward in direction of airflow and mechanically fastened to flange and backplate; cast-steel hub swaged to backplate and fastened to shaft with set screws.

F. Airfoil, Centrifugal Fan Wheels: Smooth-curved inlet flange, backplate, and hollow die-formed airfoil-shaped blades continuously welded at tip flange and backplate; cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.

G. Fan Shaft Bearings:
1. Grease-Lubricated, Tapered-Roller Bearings: Self-aligning, pillow-block type with double-locking collars and 2-piece, cast-iron housing and a rated life of 120,000 hours according to ABMA 11.
2. Grease-Lubricated Bearings: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing.

H. Belt Drives: Factory mounted, with adjustable alignment and belt tensioning, and with 1.5 service factor based on fan motor.

1. Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
2. Motor Pulleys: Adjustable pitch for use with 5-hp motors and smaller; fixed pitch for use with motors larger than 5 hp. Select pulley size so pitch adjustment is at the middle of adjustment range at fan design conditions.
3. Belts: Oil resistant, nonsparking, and nonstatic; in matched sets for multiple-belt drives.

I. Internal Vibration Isolation: Fans shall be factory mounted with manufacturer's standard vibration isolation mounting devices having a minimum static deflection of 1 inch.

J. Motor: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Enclosure Type: Totally enclosed, fan cooled.
2. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
5. Fan Motors shall be heavy duty, open drip-proof operable at scheduled voltage. If applicable, motor efficiency shall meet or exceed NEMA Premium efficiencies.
6. Fan Motors shall be heavy duty, open drip-proof operable at scheduled voltage. If applicable, motor efficiency shall meet or exceed NEMA Premium efficiencies.
7. Mount unit-mounted disconnect switches on exterior of unit.

K. Direct drive plenum fans: B. Direct drive plenum fans with integral frame motors, shall be mounted on isolation bases. Fan shall be dynamically balanced throughout the operating range to a BV-3 (0.20 in/s) per AMCA 204 test standard. Fan and motor shall be internally isolated with spring isolators. A flexible connection shall be installed between fan and unit casing to ensure complete isolation. Flexible connection shall comply with NFPA 90A and UL 181 requirements. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor in order to avoid transmission of noise and vibration through the ductwork and building structure.

L. Variable Frequency Controllers:

1. Provide a variable speed controller for each fan motor in the RTU package. VFDs shall comply with section 230555 “Motor Controls/VFD’s”. Provide a unit mounted control cabinet for each VFD.

2. Description: NEMA ICS 2, IGBT, PWM, VFC; listed and labeled as a complete unit and arranged to provide variable speed of an NEMA MG 1, Design B, 3-phase induction motor by adjusting output voltage and frequency.
3. Output Rating: 3-phase; 6 to 60 Hz, with voltage proportional to frequency throughout voltage range.
4. Unit Operating Requirements:

    a. Input ac voltage tolerance of 380 to 500 V, plus or minus 10 percent.
    b. Input frequency tolerance of 50/60 Hz, plus or minus 6 percent.
    c. Minimum Efficiency: 96 percent at 60 Hz, full load.
    d. Minimum Displacement Primary-Side Power Factor: 96 percent.
    e. Overload Capability: 1.1 times the base load current for 60 seconds; 2.0 times the base load current for 3 seconds.
    f. Starting Torque: 100 percent of rated torque or as indicated.
    g. Speed Regulation: Plus or minus 1 percent.

5. Isolated control interface to allow controller to follow control signal over an 11:1 speed range.
6. Internal Adjustability Capabilities:

a. Minimum Speed: 5 to 25 percent of maximum rpm.
b. Maximum Speed: 80 to 100 percent of maximum rpm.
c. Acceleration: 2 to a minimum of 22 seconds.
d. Deceleration: 2 to a minimum of 22 seconds.
e. Current Limit: 50 to a minimum of 110 percent of maximum rating.

7. Self-Protection and Reliability Features:

a. Input transient protection by means of surge suppressors.
b. Undervoltage and overvoltage trips; inverter overtemperature, overload, and overcurrent trips.
c. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
d. Instantaneous line-to-line and line-to-ground overcurrent trips.
e. Loss-of-phase protection.
f. Reverse-phase protection.
g. Short-circuit protection.
h. Motor overtemperature fault.

8. Automatic Reset/Restart: Attempts three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Bidirectional autospeed search shall be capable of starting into rotating loads spinning in either direction and returning motor to set speed in proper direction, without damage to controller, motor, or load.
9. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped.
10. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.
11. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.
12. Door-mounted LED status lights shall indicate the following conditions:

a. Power on.
b. Run.
c. Overvoltage.
d. Line fault.
e. Overcurrent.
f. External fault.

13. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual-speed-control potentiometer and elapsed time meter.
14. Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate the following controller parameters:

a. Output frequency (Hertz).
b. Motor speed (rpm).
c. Motor status (running, stop, fault).
d. Motor current (amperes).
e. Motor torque (percent).
f. Fault or alarming status (code).

g. Proportional-integral-derivative (PID) feedback signal (percent).
h. DC-link voltage (volts direct current).
i. Set-point frequency (Hertz).
j. Motor output voltage (volts).

15. Control Signal Interface:

a. Electric Input Signal Interface: A minimum of 2 analog inputs (0 to 10 V or 0/4-20 mA) and 6 programmable digital inputs.
b. Remote signal inputs capable of accepting any of the following speed-setting input signals from the control system:

1) 0 to 10-V dc.
2) 0-20 or 4-20 mA.
3) Potentiometer using up/down digital inputs.
4) Fixed frequencies using digital inputs.
5) RS485.
6) Keypad display for local hand operation.

c. Output signal interface with a minimum of 1 analog output signal (0/4-20 mA), which can be programmed to any of the following:

1) Output frequency (Hertz).
2) Output current (load).
3) DC-link voltage (volts direct current).
4) Motor torque (percent).
5) Motor speed (rpm).
6) Set-point frequency (Hertz).

d. Remote indication interface with a minimum of 2 dry circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

1) Motor running.
2) Set-point speed reached.
3) Fault and warning indication (overtemperature or overcurrent).
4) High- or low-speed limits reached.

16. Communications: RS485 interface allows VFC to be used with an external system within a multidrop LAN configuration. Interface shall allow all parameter settings of VFC to be programmed via BMS control. Provide capability for VFC to retain these settings within the nonvolatile memory. Communication protocol to be BacNet MSTP.
17. Integral Disconnecting Means: NEMA AB 1, instantaneous-trip circuit breaker with lockable handle.
18. Accessories:

a. Devices shall be factory installed in controller enclosure unless otherwise indicated.
b. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.
c. Standard Displays:

1) Output frequency (Hertz).
2) Set-point frequency (Hertz).
3) Motor current (amperes).
4) DC-link voltage (volts direct current).
5) Motor torque (percent).
6) Motor speed (rpm).
7) Motor output voltage (volts).

2.4 COIL SECTION

A. General Requirements for Coil Section:

1. Comply with ARI 410.
2. Fabricate coil section to allow removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
3. Coils shall not act as structural component of unit.
4. Provide a piping vestibule casing adjacent to each coil section. Min size 24” x width of coil section.
5. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.
6. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.
7. Construct coil casings of galvanized steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.
8. All coils shall be completely cleaned prior to installation into the air handling unit. Complete fin bundle in direction of airflow shall be degreased and steam cleaned to remove any lubricants used in the manufacturing of the fins, or dirt that may have accumulated, in order to minimize the chance for water carryover.
9. When two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil. The intermediate drain pan shall be designed being of sufficient size to collect all condensation produced from the coil and sloped to promote positive drainage to eliminate stagnant water conditions. The intermediate drain pan shall be constructed of the same material as the sections primary drain pan.
10. The intermediate drain pan shall begin at the leading face of the water-producing device and be of sufficient length extending downstream to prevent condensate from passing through the air stream of the lower coil.
11. Intermediate drain pan shall include downspouts to direct condensate to the primary drain pan. The intermediate drain pan outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.
12. Hydronic Coils

13. Supply and return header connections shall be clearly labeled on unit exterior such that direction of coil water-flow is counter to direction of unit air-flow.
14. Coils shall be proof-tested to 300 psig and leak-tested to 200 psig air pressure under water.
15. Headers shall be constructed of round copper pipe or cast iron.
16. Tubes shall be 1/2-inch .016 copper, with aluminum fins.

2.5 AIR FILTRATION SECTION

A. General Requirements for Air Filtration Section:

1. Comply with NFPA 90A.
2. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
3. Provide 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. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall have side access filter guides and access door(s) extending the full height of the casing to facilitate filter removal. fixed filter blockoffs as required to prevent air bypass around filters. Block-offs shall not need to be removed during filter replacement. Filters to be of size, and quantity needed to maximize filter face area of each particular unit size.

C. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall be provided with front loading filter frames. Filter holding frames shall be constructed of galvanized steel and equipped with foam gaskets to seal filters against filter frames. Frame seams shall be sealed to eliminate air bypass. Access door(s) shall be provided to facilitate filter removal. Construct doors in accordance with Section 2.04. Manufacturer to provide necessary filter clips to lock primary and secondary prefilters (if ordered) tightly to filter frame without the need for special tools, bolts or nuts. Filter holding frames shall be of a universal type to accommodate standard filters of 12x24 and 24x24 nominal size as well as appropriate fasteners.

D. Filter type, MERV rating, and arrangement shall be provided as defined in project plans and schedule.

E. Extended-Surface, Panel Filters:

1. Factory-fabricated, dry, extended-surface type.
2. Thickness: 2 inches or 4 inches.
3. Initial Resistance: 0.4”WC (Max.)
4. Arrestance (ASHRAE 52.1): 90.
5. Merv (ASHRAE 52.2): 8
6. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
7. Media-Grid Frame: Nonflammable cardboard.
8. Mounting Frames: Welded, galvanized steel, with gaskets and fasteners, suitable for bolting together into built-up filter banks.

2.6 DAMPERS

A. General Requirements for Dampers: Leakage rate, according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating," shall not exceed 2 percent of air quantity at 2000-fpm face velocity through damper and 4-inch wg pressure differential.

B. All dampers, with the exception of external bypass and multizones (if scheduled), shall be internally mounted. Dampers shall be premium ultra low leak and located as indicated on the schedule and plans. Blade arrangement (parallel or opposed) shall be provided as indicated on the schedule and drawings. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent for minimal air leakage and pressure drop. Leakage rate shall not exceed 3 CFM/square foot at one inch water gauge complying with ASHRAE 90.1 maximum damper leakage and shall be AMCA licensed for Class 1A. All leakage testing and pressure ratings shall be based on AMCA Standard 500-D. Manufacturer shall submit brand and model of damper(s) being furnished, if not Ruskin CD60.

C. per Operators: Comply with requirements in Division 23 Section "Instrumentation and Control for HVAC."

D. Electronic Damper Operators:

1. Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
2. Electronic damper position indicator shall have visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.
3. Operator Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC."
    b. Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
    c. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

4. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
5. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.
6. Size dampers for running torque calculated as follows:

    a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
    b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
    c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft of damper.
    d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
    e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
    f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.

7. Coupling: V-bolt and V-shaped, toothed cradle.
8. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
9. Fail-Safe Operation: Mechanical, spring-return mechanism with external, manual gear release on nonspring-return actuators.
10. Power Requirements (Two-Position Spring Return): 24-V ac.
11. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
12. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
13. Temperature Rating: Minus 22 to plus 122 deg F.
14. Run Time: 30 seconds.

E. Outdoor- and Return-Air Dampers: Low-leakage, double-skin, airfoil-blade, galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals in opposed-blade arrangement with steel operating rods rotating in stainless-steel sleeve bearings mounted in a single galvanized-steel frame, and with operating rods connected with a common linkage. Leakage rate shall not exceed 5 cfm/sq. ft. at 1-inch wg and 9 cfm/sq. ft. at 4-inch wg.

F. Outside air damper shall be provided with factory installed outdoor air flow monitoring station compatible with the RTU design. Outdoor air flow station shall provide 0-10V signal to BMS. Provide low voltage power wiring pre-wired with RTU as required.

G. Mixing Section: Provide a multiple-blade, air-mixer assembly located immediately downstream of mixing section.

H. Combination Filter and Mixing Section:

1. Cabinet support members shall hold 2-inch- thick, pleated, flat, permanent or throwaway filters.
2. Multiple-blade, air-mixer assembly shall mix air to prevent stratification, located immediately downstream of mixing box.

2.7 ELECTRICAL POWER CONNECTIONS

A. RTU shall have a single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.8 ACCESSORIES

A. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

B. Safeties:

1. Smoke detector.
2. Condensate overflow switch.
3. Phase-loss reversal protection.
4. High and low pressure control.

C. Coil guards of painted, galvanized-steel wire.

D. Outdoor air intake weather hood with moisture eliminator.

E. Service Lights and Switch: Factory installed in each accessible section with weatherproof cover. Factory wire lights to a single-point field connection.

2.9 CAPACITIES AND CHARACTERISTICS

A. Refer to drawings for schedules.

2.10 SOURCE QUALITY CONTROL

A. Fan Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.

B. Fan Performance Rating: Factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency. Rate performance according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating."

C. Water Coils: Factory tested to 300 psig according to ARI 410 and ASHRAE 33.

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."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-handling unit installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for steam, hydronic, and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

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. The Mechanical Contractor shall be responsible for coordinating ALL installation requirements with the Owner and any other Owner-selected Mechanical Contractor to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or welded joints, and all other installation and assembly requirements.

C. The AHU manufacturer shall provide all screws and gaskets for joining of sections in the field.

D. The Mechanical Contractor shall verify that the following items have been completed prior to scheduling the AHU manufacturer's final inspection and start up:

E. All spring-isolated components have had their shipping restraints removed and the components have been leveled.

F. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.

G. All water piping connections have been completed and hydrostatically tested and all water flow rates have been set in accordance with the capacities scheduled on the Drawings.

H. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.

I. All power wiring, including motor starters and disconnects, serving the unit has been completed.

J. All automatic temperature and safety controls have been completed.

K. All dampers are fully operational.

L. All shipping materials have been removed.

M. All (clean) filter media has been installed in the units.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to air-handling unit to allow service and maintenance.

C. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.

D. Connect condensate drain pans using NPS 1-1/4, ASTM B 88, Type M copper tubing. Extend to nearest roof drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

E. Hot- and Chilled-Water Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

F. Connect duct to air-handling units with flexible connections. Comply with requirements in Division 23 Section "Air Duct Accessories."

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.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, fill water and steam coils with water, and test coils and connections for leaks.
2. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Air-handling unit or components will be considered defective if unit or components do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 START-UP SERVICE

A. Start-up and operating requirements. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.

B. After the Mechanical Contractor has provided all water piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the Mechanical Contractor shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.

C. The Automatic Temperature Control (Building Direct Digital Control) Contractor shall be scheduled to be at the job site at the time of the equipment start up.

D. Engage a factory-authorized service representative to perform startup service.

E. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that shipping, blocking, and bracing are removed.
3. Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.
4. Verify proper power is available for starting the fans.
5. Verify proper motor rotation direction, free fan wheel rotation, and smooth bearing operations. Reconnect fan drive system, align belts, and install belt guards.
6. Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.
7. Verify that zone dampers fully open and close for each zone.
8. Verify that face-and-bypass dampers provide full face flow.
9. Verify that outdoor- and return-air mixing dampers open and close, and maintain minimum outdoor-air setting.
10. Comb coil fins for parallel orientation.
11. Verify that proper thermal-overload protection is installed for electric coils.
12. Install new, clean filters.
13. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.

F. Starting procedures for air-handling units include the following:

1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm.
2. Measure and record motor electrical values for voltage and amperage.
3. Manually operate dampers from fully closed to fully open position and record fan performance.

3.6 WARRANTY

A. AHU manufacturer shall provide, at no additional cost, a standard parts warranty that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

3.7 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

3.8 CLEANING

A. After completing system installation and testing, adjusting, and balancing air-handling unit and air-distribution systems and after completing startup service, clean air-handling units internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air-handling units.

END OF SECTION 237313

SECTION 238213
HYDRONIC HEATING PANELS

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. Hydronic heating panels.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated capacities, specialties, and accessories for each product indicated.

B. Shop Drawings:

   1. Include plans, elevations, sections, details, and attachments to other work. Detail equipment assemblies and suspension and attachment.
   2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) 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. Suspended ceiling components.
   2. Structural members to which heaters and suspension systems will be attached.
   3. Size and location of access modules .
   4. Items penetrating finished ceiling, including the following:

      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For radiant heaters to include in , operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 HYDRONIC HEATING PANELS

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. Sterling
2. Aerotek
3. Rittling

B. Description: Modular Linear sheet-metal panel with serpentine water piping, suitable for recessed mounting.

1. Panels: Minimum 0.0396-inch-thick, extruded aluminum sheet.
2. Backing Insulation: Minimum 1-inch thick, mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB with factory-applied jacket.
3. Exposed-Side Panel Finish: Polyester powder coat finish in manufacturer's standard paint color as selected by Owner.
4. Factory Piping: 5/8” O.D. ASTM B 88, Type L copper tube with ASME B16.22 wrought-copper fittings and brazed joints. Piping shall be mechanically bonded to panel.

C. Capacities and Characteristics: Per drawing schedules

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive radiant heating units for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for hydronic piping connections to verify actual locations before radiant heating and cooling unit installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install radiant heating units level and plumb.

B. Suspend radiant heaters from structure.

C. Coordinate layout and installation of radiant heaters and suspension-system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, communications system, security system, and partition assemblies.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Unless otherwise indicated, install shutoff valve and union or flange at each connection.

C. Install piping adjacent to unit to allow service and maintenance.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operate electric heating elements through each stage to verify proper operation and electrical connections.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and units.

B. Remove and replace malfunctioning units and retest as specified above.

C. After installing panels, inspect unit cabinet for damage to finish. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

D. Prepare test and inspection reports.

END OF SECTION 238213

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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. Alpha Wire Company.
2. Belden Inc.
3. Encore Wire Corporation.
4. General Cable; General Cable Corporation.
5. Senator Wire & Cable Company.

6. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2, Type XHHW-2 and Type SO.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC mineral-insulated, metal-sheathed cable, Type MI and Type SO with ground wire.

E. VFC Cable:

1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
2. Type TC-ER with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.

2.2 CONNECTORS AND SPLICES

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. 3M.
2. AFC Cable Systems, Inc.
3. Hubbell Power Systems, Inc.
4. ILSCO.
5. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
6. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 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. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway or Mineral-insulated, metal-sheathed cable, Type MI.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway, Metal-clad cable, Type MC or Mineral-insulated, metal-sheathed cable, Type MI.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. VFC Output Circuits: Type TC-ER cable with braided shield.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    b. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency and testing agency's field supervisor.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

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. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Harger Lightning & Grounding.
4. ILSCO.
5. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business

2.2 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. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 5/8 by 96 inches.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

E. Metallic Fences: Comply with requirements of IEEE C2.

1. Grounding Conductor: Bare, tinned copper, not less than No. 8 AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

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. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

G. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Manhole Grounds: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

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 the following:

a. Hangers.
b. Steel slotted support systems.
c. Trapeze hangers.
d. Clamps.
e. Turnbuckles.
f. Sockets.
g. Eye nuts.
h. Saddles.
i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Delegated-Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of trapeze hangers.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. Thomas & Betts Corporation, A Member of the ABB Group.
e. Unistrut; an Atkore International company.

2. Material: Galvanized steel.
3. Channel Width: 1-5/8 inches.
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Hilti, Inc.
2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

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) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Hilti, Inc.
3) ITW Ramset/Red Head; Illinois Tool Works, Inc.
4) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.

B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMTs, IMCs, and RMCs may be supported by openings through structure members, according to NFPA 70.

C. 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.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or

greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.

6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base as follows:

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 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 minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Surface raceways
5. Boxes, enclosures, and cabinets.
6. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

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. AFC Cable Systems, Inc.
2. Allied Tube & Conduit.
3. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
4. Southwire Company.
5. Thomas & Betts Corporation, A Member of the ABB Group.
6. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. FMC: Comply with UL 1; zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel or die cast.
b. Type: Compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

I. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

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. AFC Cable Systems, Inc.
2. CANTEX INC.
3. Kraloy.
4. RACO; Hubbell.
5. Thomas & Betts Corporation, A Member of the ABB Group.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC and Type EPC-80 PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

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. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Hoffman; a brand of Pentair Equipment Protection.
3. MonoSystems, Inc.
4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Hubbell Incorporated; Wiring Device-Kellems.
    b. MonoSystems, Inc.
    c. Legrand/Wiremold
    d. Panduit

2.5 BOXES, ENCLOSURES, AND CABINETS

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. Cooper Technologies Company.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman; a brand of Pentair Equipment Protection.
5. Hubbell Incorporated.
6. MonoSystems, Inc.
7. O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.
8. RACO; Hubbell.
9. Thomas & Betts Corporation, A Member of the ABB Group.
10. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal or sheet metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

K. Gangable boxes are allowed.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. NewBasis.
d. Oldcastle Precast, Inc.
e. Quazite: Hubbell Power Systems, Inc.
f. Synertech Moulded Products.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC or IMC.
2. Concealed Conduit, Aboveground: GRC or IMC.
3. Underground Conduit: RNC, Type EPC-40-PVC or Type EPC-80-PVC under vehicle traffic.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following:

    a. Loading dock.
    b. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.

5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC or IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. EMT: Use compression, steel or cast-metal fittings. Comply with NEMA FB 2.10.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-footintervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from RNC, Type EPC-40-PVC to GRC or IMC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

O. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Q. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

U. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

V. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.

X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Z. Locate boxes so that cover or plate will not span different building finishes.

AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

CC. Set metal floor boxes level and flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

5. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

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 for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

    a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
    b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Advance Products & Systems, Inc.
    b. CALPICO, Inc.
    c. Metraflex Company (The).
    d. Pipeline Seal and Insulator, Inc.
    e. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. HOLDRITE.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.

2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make 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.

END OF SECTION 260544

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

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 electrical identification products.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Raceways and Cables Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

C. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.3 LABELS

A. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Champion America.
c. Emedco.
d. LEM Products Inc.
e. Marking Services, Inc.
f. Panduit Corp.

B. Snap-Around Labels for Raceways and Cables Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceways they identify, and that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brady Corporation.
    b. Marking Services, Inc.
    c. Panduit Corp.
    d. Seton Identification Products.

C. Self-Adhesive Labels:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. A'n D Cable Products.
    b. Brady Corporation.
    c. Brother International Corporation.
    d. emedco.
    e. Grafoplast Wire Markers.
    f. Ideal Industries, Inc.
    g. LEM Products Inc.
    h. Marking Services, Inc.
    i. Panduit Corp.
    j. Seton Identification Products.
2. Preprinted, 3-mil-thick, polyester or vinyl flexible label with acrylic pressure-sensitive adhesive.

    a. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized to fit the cable or raceway diameter, such that the clear shield overlaps the entire printed legend.

3. Polyester or Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

    a. Nominal Size: 3.5-by-5-inch.

4. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
5. Marker for Tags: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

2.4 BANDS AND TUBES:

A. Snap-Around, Color-Coding Bands for Raceways and Cables: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters of raceways or cables they identify, and that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brady Corporation.
    b. Marking Services, Inc.
    c. Panduit Corp.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around cables they identify. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brady Corporation.
    b. Panduit Corp.

2.5 TAPES AND STENCILS:

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Carlton Industries, LP.
    b. Champion America.
    c. Ideal Industries, Inc.
    d. Marking Services, Inc.
    e. Panduit Corp.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brady Corporation.
    b. Carlton Industries, LP.
    c. emedco.
    d. Marking Services, Inc.

C. Tape and Stencil for Raceways Carrying Circuits 600 V or Less: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. LEM Products Inc.
    b. Marking Services, Inc.
    c. Seton Identification Products.

D. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Carlton Industries, LP.
    b. Seton Identification Products.

E. Underground-Line Warning Tape

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brady Corporation.
    b. Ideal Industries, Inc.
    c. LEM Products Inc.
    d. Marking Services, Inc.
    e. Reef Industries, Inc.
    f. Seton Identification Products.
2. Tape:

    a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
    b. Printing on tape shall be permanent and shall not be damaged by burial operations.
    c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

3. Color and Printing:

    a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
    b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
    c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

4. Tag:

    a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the

continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.

b. Width: 3 inches.
c. Overall Thickness: 5 mils.
d. Foil Core Thickness: 0.35 mil.
e. Weight: 28 lb/1000 sq. ft..
f. Tensile according to ASTM D 882: 70 lbf and 4600 psi.

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.6 Tags

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Carlton Industries, LP.
c. emedco.
d. Marking Services, Inc.
e. Seton Identification Products.

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Carlton Industries, LP.
c. emedco.
d. Grafoplast Wire Markers.
e. LEM Products Inc.
f. Marking Services, Inc.
g. Panduit Corp.
h. Seton Identification Products.

C. Write-On Tags:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Carlton Industries, LP.

b. LEM Products Inc.
c. Seton Identification Products.

2. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to raceway, conductor, or cable.
3. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 Signs

A. Baked-Enamel Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches.

4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Carlton Industries, LP.
b. Champion America.
c. emedco.
d. Marking Services, Inc.

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches.

4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Champion America.
c. emedco.
d. Marking Services, Inc.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. inches, minimum 1/16-inch-
b. For signs larger than 20 sq. inches, 1/8 inch thick.
c. Engraved legend with black letters on white face.
d. Punched or drilled for mechanical fasteners.

e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Carlton Industries, LP.
c. emedco.
d. Marking Services, Inc.

2.8 CABLE TIES

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. Ideal Industries, Inc.
2. Marking Services, Inc.
3. Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F according to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

G. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

I. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

J. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

K. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

L. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.3 IDENTIFICATION SCHEDULE

A. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Snap-around labels. Install labels at 10-foot maximum intervals.

B. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive vinyl label. Install labels at 30-foot maximum intervals.

C. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels containing the wiring system legend and system voltage. System legends shall be as follows:

1. "STANDBY POWER."
2. "POWER."
3. "UPS."

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

E. Power-Circuit Conductor Identification, More Than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and a separate tag with the circuit designation.

F. Install instructional sign, including the color code for grounded and ungrounded conductors using adhesive-film-type labels.

G. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.

H. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive, self-laminating polyester labels with the conductor designation.

I. Conductors To Be Extended in the Future: Attach marker tape to conductors and list source.

J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker-tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

K. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

L. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

M. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Metal-backed, butyrate warning signs.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

a. Power-transfer switches.
b. Controls with external control power connections.

N. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

O. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

P. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Engraved, laminated acrylic or melamine plastic label, punched or drilled for mechanical fasteners. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
d. Unless labels are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment To Be Labeled:

a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a engraved, laminated acrylic or melamine label.
b. Enclosures and electrical cabinets.
c. Access doors and panels for concealed electrical items.
d. Switchboards.
e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
f. Emergency system boxes and enclosures.
g. Enclosed switches.
h. Enclosed circuit breakers.
i. Enclosed controllers.
j. Variable-speed controllers.
k. Push-button stations.
l. Power-transfer equipment.
m. Contactors.
n. Remote-controlled switches, dimmer modules, and control devices.
o. Battery-inverter units.

p. Power-generating units.
q. Monitoring and control equipment.
r. UPS equipment.

END OF SECTION 260553

SECTION 260800

COMMISSIONING OF ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes commissioning process requirements for electrical systems.

B. Related Sections:

1. 019113 – Building System Commissioning

2. Division 26 Sections

1.3 SCOPE

A. Commissioning requires the participation of Division 26, Electrical, to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 019113. Division 26, Electrical, shall be familiar with Section 019113 and the Commissioning Plan issued by the Commissioning Agent (CA) and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.4 SYSTEMS TO BE COMMISSIONED

A. The following Electrical systems will be commissioned on this project:

1. Lighting controls systems: Interior lighting controls including occupancy sensors, site lighting and control system.

1.5 RESPONSIBILITIES

A. Electrical Contractor: Commissioning responsibilities applicable to the Electrical contractor of Division 26 are as described in Section 019113, Paragraph 1.10-I.

1.6 OPERATION AND MAINTENANCE (O&M) MANUALS

A. Compile and prepare documentation for all equipment and systems covered in Division 26, Electrical, and deliver to Construction Manager for inclusion in O&M Manuals in accordance with Division 1.

B. Provide the Commissioning Agent with a copy of O&M Manuals for review.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Provide test equipment necessary to fulfill testing requirements of Divisions 26, Electrical.

B. Refer to Section 019113 and Division 26 specification for other additional Division 26, Electrical requirements.

PART 3 - EXECUTION

3.1 PREFUNCTIONAL CHECKLISTS AND STARTUP

A. Prefunctional tests and checklists (PFT's) are important to ensure that the equipment and systems are connected properly and are operational. PFT's ensure that functional performance testing may proceed without unnecessary delays. The Contractor shall be responsible for performing Prefunctional testing. EVERY piece of equipment receives a full Prefunctional checkout.

B. Division 26, Electrical, has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting design objectives of Contract Documents. Commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to CA or Owner.

3.2 FUNCTIONAL PERFORMANCE TESTS

C. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to completion of systems or sub-systems at discretion of CA and CM. Beginning system testing before full completion does not relieve Contractor from fully completing system as soon as possible, including prefunctional checklists.

D. Functional performance testing requirements are in addition to and do not replace any testing required by Code or listed elsewhere in Division 26.

E. Functional performance testing procedures will be performed on but not limited to the following system types and equipment. Final functional testing requirements and procedures will be developed based on approved equipment shop drawings.

1. Interior Lighting Fixtures
    a. Equipment:
        1) Lighting controls (occupancy/vacancy sensors, daylighting controls)

3.2 ISSUES AND DEFICIENCIES

A. Refer to Section 019113 for details relating to resolution of issues and deficiencies.

3.3 TRAINING OF OWNER PERSONNEL

A. Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed. Refer to Section 019113 for details.

B. Duration of Training: Electrical Contractor shall provide training on each piece of equipment according to the following schedule:

System	**Minimum Training Hours**
Lighting System Controls	4
Total Training Time	**4 Hours**

SECTION 260923

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Photoelectric switches.
2. Indoor occupancy sensors.
3. Switchbox-mounted occupancy sensors.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Show installation details for the following:

a. Occupancy sensors.

2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of lighting control devices.

2. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES

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. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Leviton Manufacturing Co., Inc.
4. NSi Industries LLC.
5. Tyco Electronics Corporation; a TE Connectivity Ltd. company.

B. Description: Solid state, with SPST dry contacts rated for 1000 W incandescent or 1800 VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A, and compatible with ballasts and LED lamps.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
3. Time Delay: Fifteen-second minimum, to prevent false operation.
4. Surge Protection: Metal-oxide varistor.
5. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
6. Failure Mode: Luminaire stays ON.

2.2 INDOOR OCCUPANCY SENSORS

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. Bryant Electric.
2. Cooper Industries, Inc.
3. Hubbell Building Automation, Inc.
4. Leviton Manufacturing Co., Inc.
5. Lithonia Lighting; Acuity Brands Lighting, Inc.
6. Lutron Electronics Co., Inc.
7. NSi Industries LLC.
8. Philips Lighting Controls.
9. Sensor Switch, Inc.
10. Square D.
11. Watt Stopper.

B. General Requirements for Sensors:

1. Ceiling-mounted, solid-state indoor occupancy sensors.
2. Dual technology.
3. Separate power pack.
4. Hardwired connection to switch.
5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
6. Operation:

    a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

7. Sensor Output: Sensor is powered from the power pack.
8. Power: Line voltage.
9. Power Pack: Dry contacts rated for 20-A ballast or LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
10. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
12. Bypass Switch: Override the "on" function in case of sensor failure.
13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet when mounted 48 inches above finished floor.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

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. Bryant Electric.
2. Cooper Industries, Inc.
3. Hubbell Building Automation, Inc.
4. Leviton Manufacturing Co., Inc.
5. Lithonia Lighting; Acuity Brands Lighting, Inc.
6. Lutron Electronics Co., Inc.
7. NSi Industries LLC.
8. Philips Lighting Controls.
9. Sensor Switch, Inc.
10. Square D.
11. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox using hardwired connection.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
4. Switch Rating: Not less than 800-VA ballast or LED load at 120 V, 1200-VA ballast or LED load at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor Tag WS1:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP.

4. Capable of controlling load in three-way application.
5. Voltage: Match the circuit voltage.
6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
9. Color: White.
10. Faceplate: Color matched to switch.

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

A. Comply with NECA 1.

B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.

C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lighting control devices will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262416

PANELBOARDS

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. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. HID: High-intensity discharge.

E. MCCB: Molded-case circuit breaker.

F. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.

3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.5 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

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. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and GFEP Types: Two spares for each panelboard.
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or ISO 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
    b. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Owner's written permission.
3. Comply with NFPA 70E.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

E. Enclosures: Flush and Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

   a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
   b. Outdoor Locations: NEMA 250, Type 3R.
   c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Height: 84 inches maximum.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
4. Finishes:

   a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Back Boxes: Galvanized steel.

F. Incoming Mains:

1. Location: Convertible between top and bottom.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

G. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

   a. Plating shall run entire length of bus.
   b. Bus shall be fully rated the entire length.

2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

H. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

I. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: 20 percent.

J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Fused Switch.

E. Branch Overcurrent Protective Devices: Fused switches.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; by Schneider Electric.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

    a. Inverse time-current element for low-level overloads.
    b. Instantaneous magnetic trip element for short circuits.
    c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
3. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
4. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
5. Subfeed Circuit Breakers: Vertically mounted.
6. MCCB Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Breaker handle indicates tripped status.
    c. UL listed for reverse connection without restrictive line or load ratings.
    d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
    f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
    h. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
    i. Multipole units enclosed in a single housing with a single handle.

j. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
k. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."
2. Fused Switch Features and Accessories:

a. Standard ampere ratings and number of poles.
b. Mechanical cover interlock with a manual interlock override, to prevent the opening of the cover when the switch is in the on position. The interlock shall prevent the switch from being turned on with the cover open. The operating handle shall have lock-off means with provisions for three padlocks.
c. Auxiliary Contacts: Two normally open and normally closed contact(s) that operate with switch handle operation.

2.5 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NEMA PB 1.1.

D. Equipment Mounting:
   1. Attach panelboard to the vertical finished or structural surface behind the panelboard.

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Mount top of trim 90 inches above finished floor unless otherwise indicated.

G. Mount panelboard cabinet plumb and rigid without distortion of box.

H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

I. Mount surface-mounted panelboards to steel slotted supports 1-1/4 inch in depth. Orient steel slotted supports vertically.

J. Install overcurrent protective devices and controllers not already factory installed.

   1. Set field-adjustable, circuit-breaker trip ranges.
   2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

K. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

L. Install filler plates in unused spaces.

M. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

N. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Perform optional tests. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    b. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

1. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. USB charger devices.
3. Twist-locking receptacles.
4. Weather-resistant receptacles.
5. Snap switches.
6. Pendant cord-connector devices.
7. Cord and plug sets.
8. Floor service outlets and poke-through assemblies.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

C. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 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. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.
2. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.

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. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
2. Hubbell Incorporated; Wiring Device-Kellems.
3. Leviton Manufacturing Co., Inc.
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

2.3 USB CHARGER DEVICES

A. Tamper-Resistant, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1310, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Eaton (Arrow Hart).
    b. Hubbell Incorporated; Wiring Device-Kellems.
    c. Leviton Manufacturing Co., Inc.
    d. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
3. USB Receptacles: Dual, Type A.
4. Line Voltage Receptacles: Dual, two pole, three wire, and self-grounding.

2.4 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration as indicated on drawings, and UL 498.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
    b. Hubbell Incorporated; Wiring Device-Kellems.
    c. Leviton Manufacturing Co., Inc.
    d. Pass & Seymour/Legrand (Pass & Seymour).

2.5 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.6 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.

2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.7 DECORATOR-STYLE DEVICES

A. Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
b. Hubbell Incorporated; Wiring Device-Kellems.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

B. GFCI, Feed-Through Type, Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 943 Class A.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
b. Hubbell Incorporated; Wiring Device-Kellems.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

C. GFCI, Weather-Resistant Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 943 Class A.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
b. Hubbell Incorporated; Wiring Device-Kellems.
c. Pass & Seymour/Legrand (Pass & Seymour).

D. Toggle Switches, Square Face, 120/277 V, 20 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
b. Hubbell Incorporated; Wiring Device-Kellems.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

E. Lighted Toggle Switches, Square Face, 120 V, 20 A: Comply with NEMA WD 1 and UL 20.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
b. Hubbell Incorporated; Wiring Device-Kellems.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

2. Description: With neon-lighted handle, illuminated when switch is "off."

F. All branch circuits rated at 15 amperes shall only have receptacles rated at 15 amperes connected to it.

2.8 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces including garage, work and storage areas: 0.035” satin-finished stainless steel.
3. Material for Unfinished Spaces such as mechanical room, electrical room, janitor closets: Galvanized steel.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum box with lockable cover.

2.9 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, solid brass with satin finish.

D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

2.10 POKE-THROUGH ASSEMBLIES

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. Hubbell Incorporated; Wiring Device-Kellems.
2. Pass & Seymour/Legrand (Pass & Seymour).
3. Square D; by Schneider Electric.
4. Thomas & Betts Corporation, A Member of the ABB Group.
5. Wiremold / Legrand.

B. Description:

1. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
2. Comply with UL 514 scrub water exclusion requirements.
3. Service-Outlet Assembly: Pedestal type with services indicated.
4. Size: Selected to fit nominal 3-inch cored holes in floor and matched to floor thickness.
5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
6. Closure Plug: Arranged to close unused 3-inch cored openings and reestablish fire rating of floor.
7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables.

2.11 FINISHES

A. Device Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated by architect or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.

2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262813

FUSES

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. Cartridge fuses rated 600 V ac and less for use in the following:

a. Control circuits.
b. Panelboards
c. Enclosed controllers.
d. Enclosed switches.

B. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Coordination charts and tables and related data.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Closeout Procedures," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Coordination charts and tables and related data.

1.5 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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.6 FIELD CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg For more than 100 deg F apply manufacturer's ambient temperature adjustment factors to fuse ratings.

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. Cooper Bussmann; a division of Cooper Industries.
2. Edison; a brand of Cooper Bussmann; a division of Cooper Industries.
3. Littelfuse, Inc.
4. Mersen USA.

B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
2. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, fast acting.
3. Type J: 600-V, zero- to 600-A rating, 200 kAIC.
4. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

2.3 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch-high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Class L, time delay.
2. Feeders: Class RK1, time delay.
3. Motor Branch Circuits: Class RK1, time delay.
4. Power Electronics Circuits: Class J, high speed.
5. Other Branch Circuits: Class J, fast acting.
6. Control Transformer Circuits: Class CC, time delay, control transformer duty.
7. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s) in location shown on the Drawings or as indicated in the field by Owner.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

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 NFPA 70.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

1.10 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D; by Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Lugs: Mechanical type, suitable for number, size, and conductor material.
6. Service-Rated Switches: Labeled for use as service equipment.
7. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Sector; Eaton Corporation.
2. General Electric Company.
3. Siemens Industry, Inc.
4. Square D; by Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.
5. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 4.
3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    b. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

SECTION 265119

LED INTERIOR LIGHTING

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. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.

3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project.

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For luminaires, 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.

B. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Product Certificates: For each type of luminaire.

D. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

E. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

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. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.

2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE 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. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. Recessed Fixtures: Comply with NEMA LE 4.

D. Bulb shape complying with ANSI C79.1.

E. Lamp base complying with ANSI C81.61 or IEC 60061-1.

F. Rated lamp life of 35,000 hours.

G. Lamps dimmable from 100 percent to 0 percent of maximum light output.

H. Internal driver.

I. Nominal Operating Voltage: As indicated on Plans.

1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

J. Housings:

1. Extruded-aluminum housing and heat sink.
2. powder-coat finish.

2.3 DOWNLIGHT

A. See Plans for manufacturers.

B. Minimum 1,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Universal mounting bracket.

D. Integral junction box with conduit fittings.

2.4 LINEAR INDUSTRIAL

A. See Plans for manufacturers.

B. Minimum 5,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Housing and heat sink rated to the following:
1. NEMA 4X.
2. IP 54.
3. IP 66.
4. Marine and wet locations.
5. CSA C22.2 No 137.

2.5 RECESSED LINEAR

A. See Plans for manufacturers.

B. Minimum 2,000 lumens. Minimum allowable efficacy of 85 lumens per watt.

C. Integral junction box with conduit fittings.

2.6 STRIP LIGHT

A. See Plans for manufacturers.

B. Minimum 750 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Integral junction box with conduit fittings.

2.7 SURFACE MOUNT, LINEAR

A. See Plans for manufacturers.

B. Minimum 750 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Integral junction box with conduit fittings.

2.8 SURFACE MOUNT, NONLINEAR

A. See Plans for manufacturers.

B. Minimum 750 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Integral junction box with conduit fittings.

2.9 SUSPENDED, LINEAR

A. See Plans for manufacturers.

B. Minimum 2,000 lumens. Minimum allowable efficacy of 85 lumens per watt.

2.10 SUSPENDED, NONLINEAR

A. See Plans for manufacturers.

B. Minimum 2,000 lumens. Minimum allowable efficacy of 85 lumens per watt.

C. Integral junction box with conduit fittings.

2.11 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. prismatic acrylic
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Powder-coat finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.12 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.13 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch-diameter aircraft cable supports adjustable to 120 inches in length.
2. Ceiling mount with pendant mount with 5/32-inch-diameter aircraft cable supports adjustable to 120 inches in length.
3. Ceiling mount with hook mount.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

SECTION 265213

EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Emergency lighting.
2. Exit signs.
3. Materials.
4. Luminaire support components.

1.2 DEFINITIONS

A. Correlated Color Temperature (CCT): The absolute temperature, measured in kelvins, of a blackbody whose chromaticity most nearly resembles that of the light source.

B. Color Rendering Index (CRI): Measure of the degree of color shift that objects undergo when illuminated by the light source as compared with the color of those same objects when illuminated by a reference source.

C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.

D. Lumen (lm): The SI derived unit of luminous flux equal to the luminous flux emitted within a unit solid angle by a unit point source (1 lm = 1 cd-sr).

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of emergency lighting unit, exit sign, and emergency lighting support.

a. Include data on features, accessories, and finishes.
b. Include physical description of unit and dimensions.
c. Battery and charger for light units.
d. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
e. Include photometric data and adjustment factors based on laboratory tests by, or under supervision of, qualified luminaire photometric testing laboratory, for each luminaire type.

B. Shop Drawings:

1. For nonstandard or custom luminaires.

a. Include plans, elevations, sections, and mounting and attachment details.
b. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
c. Include diagrams for power, signal, and control wiring.

C. Samples: For each product and for each color and texture specified.

D. Samples for Initial Selection: For each type of luminaire with factory-applied finishes.

E. Samples for Verification: For each type of luminaire.

1. Include Samples of luminaires and accessories to verify finish selection.

F. Product Schedule:

1. For emergency lighting units. Use same designations indicated on Drawings.
2. For exit signs. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of luminaire.

B. Product Test Reports: For each luminaire for tests performed by, or under supervision of, qualified luminaire photometric testing laboratory.

C. Sample Warranty: For manufacturer's special warranty.

1.5 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. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Luminaire-mounted, emergency battery pack: One for every 20 emergency lighting units. Furnish at least one of each type.
3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.6 QUALITY ASSURANCE

A. FM Global Compliance: Luminaires for hazardous locations must be listed and labeled for indicated class and division of hazard by FM Global.

B. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of luminaires and signs in mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging completed Work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 WARRANTY

A. Special Installer Extended Warranty for Emergency and Exit Lighting: Installer warrants that fabricated and installed emergency luminaires and exit signs, including batteries, perform in accordance with specified requirements and agrees to repair or replace components and assemblies that fail to perform as specified within extended warranty period.

1. Extended Warranty Period: Two year(s) from date of Substantial Completion; full coverage for labor, materials, and equipment.

B. Special Manufacturer Extended Warranty for Batteries for Emergency and Exit Lighting: Manufacturer warrants that batteries for emergency luminaires and exit signs perform in accordance with specified requirements and agrees to provide repair or replacement of batteries that fail to perform as specified within extended warranty period.

1. Extended Warranty Period: Five year(s) from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

A. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70 and UL 924, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. Comply with NFPA 101.

C. Comply with NEMA LE 4 for recessed luminaires.

D. Comply with UL 1598 for fluorescent luminaires.

E. Lamp Base: Comply with ANSI C81.61 or IEC 60061-1.

F. Bulb Shape: Complying with ANSI C79.1.

G. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast.

1. Emergency Connection: Operate one lamp(s) continuously at an output of 1200 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
3. Nightlight Connection: Operate lamp continuously at 40 percent of rated light output.
4. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

5. Battery: Sealed, maintenance-free, nickel-cadmium type.
6. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
7. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

H. External Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, suitable for powering one or more lamps, remote mounted from luminaire.

1. Emergency Connection: Operate one LED lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
3. Nightlight Connection: Operate lamp in a remote luminaire continuously.
4. Battery: Sealed, maintenance-free, nickel-cadmium type.
5. Charger: Fully automatic, solid-state, constant-current type.
6. Housing: Type 1 enclosure listed for installation inside, on top of, or remote from luminaire. Remote assembly must be located no less than half of distance recommended by ballast manufacturer, whichever is less.
7. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
8. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
9. Remote Test: Switch in handheld remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
10. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.2 EMERGENCY LIGHTING

A. General Characteristics: Self-contained units.

B. Emergency Luminaire (See Drawings)
1. Options:

a. Operating at nominal voltage of 120 V(ac).
b. Internal emergency power unit.
c. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.
d. UL 94 flame rating.

C. Emergency Lighting Unit (See Drawings)
1. Options:

a. Operating at nominal voltage of 120 V(ac).
b. Wall with universal junction box adaptor.
c. UV stable thermoplastic housing, rated for damp locations.
d. Two LED lamp heads.
e. Internal emergency power unit.

D. Remote Emergency Lighting Unit (See Drawings)
1. Options:

a. Operating at nominal voltage of 120 V(ac).
b. Wall with universal junction box adaptor.
c. UV stable thermoplastic housing, rated for damp locations.
d. Two LED lamp heads.
e. External emergency power unit.

2.3 EXIT SIGNS

A. General Characteristics: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Sign (See Drawings)
1. Options:

a. Operating at nominal voltage of 120 V(ac).
b. Lamps for AC Operation:

1) Fluorescent, two for each luminaire; 20,000 hours of rated lamp life.
2) LEDs; 50,000 hours minimum rated lamp life.

c. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.
d. Master/Remote Sign Configurations:

1) Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply for power connection to remote unit.
2) Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.

2.4 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components must be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access:

1. Smooth operating, free of light leakage under operating conditions.
2. Designed to permit relamping without use of tools.
3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. [**Tempered Fresnel glass**] [**Prismatic glass**] [**Diffuse glass**] [**Clear glass**] [**Prismatic acrylic**] [**Clear, UV-stabilized acrylic**].
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
4. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

D. Housings:

1. [**Extruded aluminum**] <**Insert type**> housing[**and heat sink**].
2. [**Clear**] <**Insert color**> [**anodized**] [**powder coat**] [**painted**] finish.

E. Conduit: [**ERMC**] [**EMT**] [**FMC**], minimum metric designator 21 (trade size 3/4).

2.5 METAL FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Support Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 0.106 inch (2.69 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

B. Install lamps in each luminaire.

C. Supports:

1. Sized and rated for luminaire and emergency power unit weight.
2. Able to maintain luminaire position when testing emergency power unit.
3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
4. Luminaire-mounting devices must be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.

D. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

E. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inch (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Ceiling Grid Mounted Luminaires:

1. Secure to outlet box, if provided.
2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by Architect.

B. Tests and Inspections:

1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

C. Nonconforming Work:

1. Luminaire will be considered defective if it does not pass operation tests and inspections.
2. Remove and replace defective units and retest.

D. Prepare test and inspection reports.

E. Manufacturer Services:

1. Engage factory-authorized service representative to supervise field tests and inspections.

3.5 SYSTEM STARTUP

A. Perform startup service:

1. Charge emergency power units and batteries minimum of one hour and depress switch to conduct short-duration test.
2. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

3.6 ADJUSTING

A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:

1. Inspect luminaires. Replace lamps, emergency power units, batteries, exit signs, and luminaires that are defective.

a. Parts and supplies must be manufacturer's authorized replacement parts and supplies.

2. Conduct short-duration tests on all emergency lighting.

3.7 PROTECTION

A. Remove and replace luminaires and exit signs that are damaged or caused to be unfit for use by construction activities.

END OF SECTION 265213

SECTION 265619

EXTERIOR LIGHTING

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. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaire.

4. Lamps, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
5. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.

    a. Manufacturer's Certified Data: Photometric data certified by manufacturer’s laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.

6. Wiring diagrams for power, control, and signal wiring.
7. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

C. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports and seismic restraints.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For luminaires, 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.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of the following:

1. Luminaire.

C. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Source quality-control reports.

E. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.

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. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Diffusers and Lenses: One for every 100of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

D. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.10 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.11 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE 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. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. UL Compliance: Comply with UL 1598 and listed for wet location.

D. Lamp base complying with ANSI C81.61 or IEC 60061-1.

E. Bulb shape complying with ANSI C79.1.

F. CRI of minimum 70. CCT of 4000 K.

G. L70 lamp life of 50,000 hours.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Internal driver.

J. Nominal Operating Voltage: As indicated on plans.

K. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.

L. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE TYPES

A. Area and Site:

1. See Plans for manufacturers.
2. Luminaire Shape: Square.
3. Mounting: As indicated on plans.
4. Luminaire-Mounting Height: As indicated on architectural plans.
5. Distribution: As indicated on plans.
6. Diffusers and Globes: Prismatic acrylic.
7. Housings:

    a. Extruded-aluminum housing and heat sink.
    b. Powder-coat finish.

2.4 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage and coating.
c. CCT and CRI for all luminaires.

2.5 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. 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.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

a. Color: As indicated on plans.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is substantially complete, clean luminaires used for temporary lighting and install new lamps.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

    a. IES LM-5.
    b. IES LM-50.
    c. IES LM-52.
    d. IES LM-64.
    e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265619

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. Magnetic door holders.
7. Remote annunciator.
8. Addressable interface device.
9. Digital alarm communicator transmitter.
10. Fire alarm wire and cable.

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.

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.
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.
13. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

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. NICET-certified, fire-alarm technician; Level III minimum.
    c. Licensed or certified by authorities having jurisdiction.

D. Delegated-Design Submittal: 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 professional 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 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

1.6 Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following 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. Record copy of site-specific software.
g. 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.

h. Manufacturer's required maintenance related to system warranty requirements.
i. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.

2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 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. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
3. Smoke Detectors, Heat Detectors, and Carbon Monoxide Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
5. Keys and Tools: One extra set for access to locked or tamperproofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.
8. Provide all necessary hardware and programming to provide the client with 20% spare capacity on all initiating and indicating circuits.
9. Provide as part of the base contract all labor and materials to install ten (10) additional fire alarm devices during construction. The ten (10) fire alarm device can be but not limited to smoke detector, heat detector, door holder, duct detector, fan shutdown, tamper switches, flow switches, etc. Include all labor and materials including wire, boxes, conduit, terminations, hardware, software, programming and testing.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

C. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.10 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 facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify 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.

1.11 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.

1.12 WARRANTY

A. 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. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. 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 andhorn/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Automatic sprinkler system water flow.
6. Fire-extinguishing system operation.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Activate voice/alarm communication system.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Close smoke dampers in air ducts of designated air-conditioning duct systems.
9. Recall elevators to primary or alternate recall floors.
10. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Carbon monoxide detector.
3. Elevator shunt-trip supervision.
4. User disabling of zones or individual devices.
5. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Hose cabinet door open.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.

2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.

F. Elevator shaft or elevator machine room heat detector signal shall initiate the following actions in addition to the action indicated above:

1. Activate elevator shunt trip. There shall be a delay in the activation of the power shunt trip. This delay will be the time it takes the elevator to travel from the top of the hoist way to the lowest recall level.

G. Signal from carbon monoxide detector shall initiate the following actions:

1. Initiate supervisory signal to system and records at the main panel and remote annunciator.
2. Transmits a (supervisory) carbon monoxide signal to central station.
3. Continuously operate sounder base associated with the carbon monoxide detector.
4. Continuously operate carbon monoxide alarm audio/visual notification devices.

2.3 FIRE-ALARM CONTROL UNIT

A. Manufacturers: Subject to compliance with requirements all equipment shall be Siemens Cerberus™ PRO FC-922 by Open system Metro In order to assure the Owner of all factory warranties, all equipment shall be obtained from an approved factory authorized distributor. The manufacturer and/or his authorized distributor shall show satisfactory evidence that he maintains a fully equipped factory authorized service organization, stocked with factory approved replacement parts and is capable of furnishing adequate inspection and service of equipment.

1. Provided and subject to compliance with requirements herein, the following alternate manufacturers are approved:

a. Notifier a GE-Honeywell Company
b. EST, UTC Fire & Security, A United Technologies Company

B. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.

a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.
c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.

d. The FACP shall be listed for connection to a central-station signaling system service.
e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.

2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, three line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1. Pathway Class Designations: NFPA 72, Class B.
2. Pathway Survivability: Level 0.
3. Install no more than 100 addressable devices on each signaling-line circuit.
4. Serial Interfaces:

a. One dedicated RS 485 port for central-station operation using point ID DACT.
b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
c. One USB port for PC configuration.

E. Notification-Appliance Circuit:

1. FIRE ALARM: Speaker appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. CARBON MONOXIDE ALARM: Audible appliances shall sound in a four-pulse temporal pattern, as defined in NFPA 72, or a constant tone. Carbon monoxide alarm sound shall be different than the fire alarm sound.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

F. Elevator Recall:

1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:

a. Elevator lobby detectors except the lobby detector on the designated floor.
b. Smoke detector in elevator machine room.

c. Smoke detectors in elevator hoistway.

2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

G. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

H. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

I. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals, and supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

J. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

K. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

L. The system shall support H or O -series devices and Siemens Cerberus™ PRO series devices.

M. The system shall be capable of remote monitoring via Siemens Cerberus™ PROView®, a proprietary software system that provides a graphical representation of the fire alarm control panel at a remote PC when connected via Ethernet to the system. The display will show the exact state of the panel, including blinking LEDs, and with menu buttons for control.

2.4 MANUAL FIRE-ALARM BOXES

A. Manufacturers: Devices shall be compatible with new Fire Alarm control panel. Subject to compliance with requirements, provide products by the following:

1. Siemens Cerberus or approved equal.

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.

2.5 SYSTEM SMOKE DETECTORS

A. Manufacturers: Devices shall be compatible with new Fire Alarm control panel. Subject to compliance with requirements, provide products by the following:

1. Siemens Cerberus or approved equal

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. Each sensor shall have multiple levels of detection sensitivity.
4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.

2.6 CARBON MONOXIDE DETECTORS

A. 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.
9. Provide with sounder bases for local audio annunciation.

2.7 MULTICRITERIA DETECTORS

A. Mounting: Twist-lock base interchangeable with smoke-detector bases.

B. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Automatically adjusts its sensitivity by means of drift compensation and smoothing algorithms. The detector shall send trouble alarm if it is incapable of compensating for existing conditions.

D. Test button tests all sensors in the detector.

E. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

1. Primary status.
2. Device type.
3. Present sensitivity selected.
4. Sensor range (normal, dirty, etc.).

F. Sensors: The detector shall be comprised of four sensing elements including a smoke sensor, a carbon monoxide sensor, an infrared sensor, and a heat sensor.

1. Smoke sensor shall be photoelectric type as described in "System Smoke Detectors" Article.
2. Carbon monoxide sensor shall be as described in "Carbon Monoxide Detectors" Article.
3. Heat sensor shall be as described in "Heat Detectors" Article.
4. Each sensor shall be separately listed according to requirements for its detector type.

2.8 HEAT DETECTORS

A. Manufacturers: Devices shall be compatible with new Fire-Lite Alarms control unit. Subject to compliance with requirements, provide products by the following:

1. Siemens Cerberus or approved equal

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, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.9 NOTIFICATION APPLIANCES

A. Manufacturers: Devices shall be compatible with new Fire-Lite Alarms control unit. 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. System Sensor.
2. Wheelock; a brand of Eaton.

B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, 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:

a. Fire alarm unit: Factory finished, red with “FIRE” in white letters.
b. Carbon monoxide unit: Factory finished, white with “CARBON MONOXIDE” in blue letters.

2.10 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnets: Require no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.

B. Material and Finish: Match door hardware.

2.11 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.12 ADDRESSABLE INTERFACE DEVICE

A. 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.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall.

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.

D. Control Module:

1. Operate notification devices.

2.13 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.14 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Comtran Corporation.
2. Draka Cableteq USA.
3. Genesis Cable Products; Honeywell International, Inc.
4. Rockbestos-Suprenant Cable Corp.
5. West Penn Wire.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 16 AWG.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

E. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire alarm and cable tray installation, plenum rated.

F. All conductors and cables run exposed shall be plenum rated.

G. Fire alarm wire and cable shall be New York City certified and listed for 150°C minimum.

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 new control panel in new part of the building.
2. Connect new equipment to existing monitoring equipment at the supervising station.
3. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control and monitoring 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 or Annex B 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. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

I. 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.

J. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

K. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

L. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.3 PATHWAYS

A. Pathways above recessed ceilings and in nonaccessible locations may be routed exposed.

1. Exposed pathways located less than 96 inches above the floor shall be installed in EMT.

B. Box covers shall be painted red enamel.

3.4 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method:

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Cables and pathways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
3. Fire-Rated Cables: Use of two-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is permitted.
4. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or pathway as signaling line circuits.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color Coding: Color code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and another for supervisory circuits. Paint fire alarm system junction boxes and covers red.

F. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function

3.5 CONNECTIONS

A. 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. Alarm-initiating connection to fire suppression system in kitchen.
2. Smoke dampers in air ducts of designated HVAC duct systems.
3. Magnetically held-open doors.
4. Electronically locked doors and access gates.
5. Alarm-initiating connection to elevator recall system and components.
6. Supervisory connections at valve supervisory switches.
7. Supervisory connections at elevator shunt-trip breaker.
8. Data communication circuits for connection to building management system.
9. Supervisory connections at fire-extinguisher locations.
10. Existing zoned annunciation circuits.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.7 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.

3.8 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

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 audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. 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.

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 284621.11

EARTH MOVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements and Section 01 50 00 Temporary Facilities and Controls apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Preparing subgrades for curbs, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for stormwater practices and utility structures.
3. Subbase course for concrete walks and pavements.
4. Excavating and backfilling trenches for buried utilities and pits for buried utility structures.
5. Excavation for mass grading of site.

1.03 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Geotechnical Engineer.
2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Geotechnical Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

1. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. (0.76 cu. m) in place that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, or ripping. Excavation of Trenches and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- (1065-mm-) wide, short-tip-radius rock bucket; rated at not less than 120-hp (89-kW) flywheel power with bucket-curling force of not less than 25,000 lbf (111 kN) and stick-crowd force of not less than 18,700 lbf (83 kN); measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp (157-kW) flywheel power and developing a minimum of 45,000-lbf (200-kN) breakout force; measured according to SAE J-732.

F. Structures: Slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subbase Course: Layer placed between the subgrade and asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

I. Utilities: include on-site underground pipes, conduits, ducts, and cables, as well as underground services within 5 feet of the building.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Each type of detectable warning tape.
2. Drainage fabric.
3. Separation fabric.

1.05 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; meeting the requirements of NYSDOT Item # 304.12.

F. Structual Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Crushed Stone: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; meeting the requirements of NYSDOT Item # 623.12 and gradation requirements of NYSDOT Item # 605.0901.

I. Rip Rap: Medium stone fill of crushed or uncrushed rock meeting the requirements of NYSDOT Item # 620.04, unless otherwise specified on the Drawings.

J. Bank Run Gravel: Naturally graded mixture of natural sand or sand and gravel, meeting ASTMD 2487 Soil Classification Groups GW, GP, or GM (Gravelly Soils), or SW, SP, or SM (Sandy Soils).

2.02 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 110 lbf (490 N); ASTM D 4632.
2. Tear Strength: 40 lbf (178 N); ASTM D 4533.
3. Puncture Resistance: 50 lbf (222 N); ASTM D 4833.
4. Water Flow Rate: 150 gpm per sq. ft. (100 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 50 (0.3 mm); ASTM D 4751.

C. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum proper- ties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D

4751. **PART 3 - EXECUTION**

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and waterways.

3.02 DEWATERING

A. Provide in accordance with Section 01 50 00 Temporary Facilities and Controls.

3.03 EXCAVATION, GENERAL

A. Classified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.04 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Equipment Pads: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or mi- nus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3.05 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.06 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe per project plans and details.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: As indicated on construction plans.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.07 APPROVAL OF SUBGRADE

A. Notify Geotechnical Engineer when excavations have reached required subgrade.

B. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer.

3.08 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings as directed by structural and geotechnical engineer.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Geotechnical Engineer.

3.09 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
2. Soil material shall be screened to be 3” minus and stockpiled on site. Soil material shall be in accordance with section 2.1 of Earth Moving 31 20 00.
3. Top soil material shall be screened to be 1” minus and stockpiled onsite. Topsoil shall be in accordance with Section 2.2 of Turfs and Grasses Section 32 92 00.

3.10 BACKFILL

B. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation as specified on construction plans.
2. Surveying locations of underground utilities for record documents.
3. Inspecting and testing underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.

C. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

D. Coordinate backfilling with utilities testing.

E. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

F. Place and compact final backfill of satisfactory soil material to final subgrade.

G. Install warning tape directly above utilities, 18 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal, so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.

3.13 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 12 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under utility structures and paved shoulders, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 92 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below sub- grade and compact each layer of backfill or fill material at 90 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

3.16 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course on prepared subgrade and as follows:

1. Place base course material over subbase.
2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 92 percent of maximum dry unit weight according to ASTM D 1557.
3. Shape subbase and base to required crown elevations and cross-slope grades.
4. When thickness of compacted subbase or base course is 6 inches (150 mm) or less, place materials in a single layer.
5. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 FIELD QUALITY CONTROL

A. Geotechnical Special Inspector: Owner shall engage a qualified independent geotechnical engineering special inspection agency to perform field quality-control testing.

B. Allow Geotechnical Special Inspector to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Geotechnical Special Inspector will test compaction of soils in place according to ASTM D 6938. Tests will be performed at the following locations and frequencies:

1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area, but in no case fewer than three tests.
2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet (46 m) or less of trench length, but no fewer than two tests.

D. When the Geotechnical Special Inspector reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, back-fill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Transport surplus satisfactory soil offsite.

1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it offsite per 6 NYCRR 360.

END OF SECTION 31 2000

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes excavation and backfill as required for pipe installation or other construction in the trench, and removal and disposal of water, in accordance with the applicable provisions of Section 31 20 00 Earth Moving and Section 31 50 00 Excavation Support and Protection unless modified herein.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXCAVATION

A. The trench excavation shall be located as shown on the Drawings or as specified. Under ordinary conditions, excavation shall be by open cut from the ground surface. Where the depth of trench and soil conditions permit, tunneling may be required beneath cross walks, curbs, gutters, pavements, trees, driveways, railroad tracks and other surface structures. No additional compensation will be allowed for such tunneling over the price bid for open cut excavation of equivalent depths below the ground surface unless such tunnel excavation is specifically provided for in the Bidding Documents.

B. Trenches shall be excavated to maintain the depths as shown on the Drawings or as specified for the type of pipe to be installed.

C. The alignment and depth shall be determined and maintained by the use of a string line installed on batter boards above the trench, a double string line installed along side of the trench or a laser beam system.

D. The minimum width of trench excavation shall be 12 inches on each side of the pipe hub.

E. Trenches shall not be opened for more than 300 feet in advance of pipe installation nor left unfilled for more than 100 feet in the rear of the installed pipe when work is in progress without the consent of the Engineer. Open trenches shall be protected and barricaded as required. No trench shall be left open over night unless an adequate road plan is provided.

F. Bridging across open trenches shall be constructed and maintained where required. Provide shop drawing of bridging or road plate system designed and stamped by NYS Licensed Professional Engineer.

3.02 SUBGRADE PREPARATION FOR PIPE

A. Where pipe is to be laid on undisturbed bottom of excavated trench, mechanical excavation shall not extend lower than the finished subgrade elevation at any point.

B. Where pipe is to be laid on special granular material the excavation below subgrade shall be to the depth specified or directed. The excavation below subgrade shall be refilled with special granular material as specified or directed, shall be deposited in layers not to exceed 6 inches and shall be thoroughly compacted prior to the preparation of pipe subgrade.

C. The subgrade shall be prepared by shaping with hand tools to the contour of the pipe barrel to allow for uniform and continuous bearing and support on solid undisturbed ground or embedment for the entire length of the pipe.

D. Pipe subgrade preparation shall be performed immediately prior to installing the pipe in the trench. Where bell holes are required they shall be made after the subgrade preparation is complete and shall be only of sufficient length to prevent any part of the bell from becoming in contact with the trench bottom and allowing space for joint assembly.

3.03 STORAGE OF MATERIALS

A. Traffic shall be maintained at all times in accordance with the applicable Highway Permits, Division 01 General Requirements, and Drawings.

B. Where conditions do not permit storage of materials adjacent to the trench, the material excavated from a length as may be required, shall be removed by the Contractor, at his cost and expense, as soon as excavated. The material subsequently excavated shall be used to refill the trench where the pipe had been built, provided it be of suitable character. The excess material shall be removed to locations selected and obtained by the Contractor.

1. The Contractor shall, at his cost and expense, bring back adequate amounts of satisfactory excavated materials as may be required to properly refill the trenches.

C. If directed by the Engineer, the Contractor shall refill trenches with satisfactory soil materials or other suitable materials and excess excavated materials shall be disposed of offsite by the contractor.

3.04 REMOVAL OF WATER AND DRAINAGE

A. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the trench, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work.

B. The removal of water shall be in accordance Section 01 50 00 Temporary Facilities and Controls.

3.05 PIPE EMBEDMENT

A. All pipe shall be protected from lateral displacement and possible damage resulting from superimposed backfill loads, impact or unbalanced loading during backfilling operations by being adequately embedded in suitable pipe embedment material. To ensure adequate lateral and vertical stability of the installed pipe during pipe jointing and embedment operations, a sufficient amount of the pipe embedment material to hold the pipe in rigid alignment shall be uniformly deposited and thoroughly compacted on each side, and back of the bell, of each pipe as laid.

B. Concrete cradle and encasement of the class specified shall be installed where and as shown on the Contract Drawings or ordered by the Engineer. Before any concrete is placed, the pipe shall be securely blocked and braced to prevent movement or flotation. The concrete cradle or encasement shall extend the full width of the trench as excavated unless otherwise authorized by the Engineer. Where concrete is to be placed in a sheeted trench it shall be poured directly against sheeting to be left in place or against a bond-breaker if the sheeting is to be removed.

C. Embedment materials placed above the centerline of the pipe or above the concrete cradle to a depth of 12 inches above the top of the pipe barrel shall be deposited in such manner as to not damage the pipe. Compaction shall be as required for the type of embedment being installed.

3.06 BACKFILL ABOVE EMBEDMENT

A. The remaining portion of the pipe trench above the embedment shall be refilled with suitable materials compacted as specified.

1. The trench shall be refilled in horizontal layers not more than 8 inches in thickness, and compacted per Section 31 20 00 Earth Moving.

2. Hand tamping shall be required around buried utility lines or other subsurface features that could be damaged by mechanical compaction equipment.

B. Backfilling of trenches beneath, across or adjacent to drainage ditches and water courses shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches and the backfill shall be protected from surface erosion by adequate means.

1. Where trenches cross waterways, the backfill surface exposed on the bottom and slopes thereof shall be protected by means of stone or concrete rip-rap or pavement.

C. All settlement of the backfill shall be refilled and compacted as it occurs.

D. Temporary pavement shall be placed as required by the Highway Work Permits and all Laws and Regulations.

END OF SECTION 31 2333

EXCAVATION SUPPORT AND PROTECTION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes temporary excavation support and protection systems.

B. Related Sections include the following:

1. Section 01 5000 - Temporary Facilities and Controls for temporary utilities and support facilities.

1.03 PERFORMANCE REQUIREMENTS

A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

1. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis by a qualified professional engineer.
2. Install excavation support and protection systems without damaging existing buildings, pavements, and other improvements adjacent to excavation.
3. Prevent surface water from entering excavations per Division 01 General Requirements.
4. Monitor vibrations, settlements, and movements.

1.04 SUBMITTALS

A. Shop Drawings for Information: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems.

1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Qualification Data: For Installer and professional engineer.

D. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems.

1.05 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Construction Manager and then only after arranging to provide temporary utility services according to requirements indicated.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
   1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
   2. The geotechnical report is included elsewhere in the Project Manual.

C. Survey adjacent structures and improvements, employing a qualified professional engineer or land surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
   1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Construction Manager if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 3 inches (75 mm).

E. Tiebacks: Steel bars, ASTM A 722/A 722M.

F. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
   1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
   1. Do not close or obstruct walks or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

D. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.02 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.03 SOLDIER BEAMS AND LAGGING

A. Install steel soldier beams before starting excavation. Space soldier beams at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier beams as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at centers indicated and secure to soldier beams.

3.04 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

3.05 UNDERPINNING

A. Excavate as required for placing underpinning in alternate sections not exceeding 2'-0" in width and to depths required to install the concrete Work as shown. If not otherwise shown carry the underpinning down to the level of the footings of the new construction. Alternate sections of concrete underpinning shall be in place supporting the superimposed loads properly before adjacent sections of earth are excavated.

B. Provide approved shoring as required to prevent damage to existing Work until the under pinning is complete and in condition to support the structure.

C. Install forms for exposed faces and at each end of each section of the concrete underpinning. No forms will be required for underpinning in contact with existing Work.

D. Roughen and clean existing concrete surfaces that will be in contact with concrete underpinning. Wet such surfaces and then coat with neat cement grout. Place new concrete before the grout has attained its initial set.

E. Install concrete underpinning in alternate sections not exceeding 4'-0" in width and up to approximately 3 inches below the bottom of the existing foundations to be supported. Provide a 2 x 4 inch key type construction joint for full height of the concrete at each end of each section. After the underpinning has set for 24 hours, pack the void between the top of the underpinning and the existing Work full with stiff concrete solidly rammed in place.

F. Provide wedges, plates and beams to transfer the load of the structure to the underpinning if required to prevent settlement.

3.06 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work, unless otherwise approved by Architect.
2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.07 REMOVAL AND REPAIRS

B. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Fill voids immediately with approved backfill compacted to density specified in Section 31 20 00 Earth Moving-Site.
2. Repair or replace, as approved by Architect or Construction Manager, adjacent work damaged or displaced by removing excavation support and protection systems.

C. Leave excavation support and protection systems permanently in place.

END OF SECTION

ASPHALT PAVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Aggregate base course.

B. Road Paving: Double course bituminous concrete paving.

C. Heavy Duty Road Paving: Double course bituminous concrete paving.

D. Walkway Paving: Single course bituminous concrete paving.

E. Asphalt Repairs.

F. Hot mix asphalt overlay.

G. Hot-mix asphalt patching.

H. Surface sealer.

1.03 RELATED REQUIREMENTS

A. Section 32 1313 - Concrete Paving.

1.04 REFERENCE STANDARDS

A. New York State Department of Transportation

B. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; 2015.

C. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt
1. Pavements," unless more stringent requirements are indicated.

D. AI MS-19 - A Basic Asphalt Emulsion Manual; Fourth Edition.

1.05 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

C. Job-Mix Designs: For each job mix proposed for the Work.

D. Indicate, with international graphics symbol, spaces dedicated to people with disabilities

E. Shop Drawings: Pavement markings, lane separations, and defined parking spaces.

F. Samples: For each paving fabric, 12 by 12 inches minimum.

G. Qualification Data: For manufacturer.

H. Material Test Reports: For each paving material.

I. Material Certificates: For each paving material, signed by manufacturers.

1.06 QUALITY ASSURANCE

A. Manufacturer shall be a paving-mix manufacturer registered with and approved by the New York DOT.

B. Perform Work in accordance with State of New York Highways standard.

C. Mixing Plant: Complying with State of New York Highways standard.

D. Obtain materials from same source throughout.

1.07 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Comply with SHA for asphalt paving work.

B. Conform to New York State and NY DOT code for paving work on public property.

1.08 FIELD CONDITIONS

C. Prime and Tack Coats: Minimum surface temperature of 60 deg F

D. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

E. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

F. Place bitumen mixture when temperature is not more than 15 F degrees (8 C degrees) below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Asphalt concrete and all related items shall meet the requirements of NYSDOT Section 400

B. Aggregate for Base Course shall be Type 4 and conform to the requirements of Section 304 of the NY State DOT Specifications.

1. Gradation shall conform to the following:

a.	Sieve Size Designation	Percent Passing by Weight
b.	3 inch	100%.
c.	2 inch	90-100%
d.	¼ inch	30-65%.
e.	No. 40	5-40%.
f.	No. 200	0-10%

C. Binder Course: Type 3, NYSDOT Sections 401, 403

D. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Water: Potable.

F. Surface Course: Type 7F, NYSDOT Sections 401, 403

G. Primer: In accordance with State of New York Highways standards.

H. Tack Coat: In accordance with State of New York Highways standards 702-90.

I. Seal Coat: AI MS-19, slurry type.

2.02ASPHALT PAVING MIXES AND MIX DESIGN

A. Refer to NYDOT Specification.

B. Submit proposed mix design of each class of mix for review prior to beginning of work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.

D. Review condition of subgrade and preparatory work.

E. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

3.02 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 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 lay-down 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:

D. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.

E. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

F. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

G. 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.

H. 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.

I. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

J. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.03 AGGREGATE BASE COURSE

A. Proof roll subbase surface with a ten (10) ton static steel wheel roller to check for unstable or otherwise unsuitable areas, as determined by the Architect. Replace and recompact all unsatisfactory areas, as approved by the Architect, prior to commencement of paving operations.

B. Construction of crushed stone base shall be in accordance with the applicable requirements of Section 304 of the New York State Department of Transportation Specifications and as required herein.

3.04 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to 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 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. 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.

3.05 PREPARATION - TACK COAT

A. Apply tack coat in accordance with New York State Department of Transportation.

B. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.06 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Asphalt concrete shall not be applied on a wet surface or when the air temperature is below 45 degrees F. unless otherwise directed, or when weather conditions would prevent proper construction.

B. Install Work in accordance with State of New York Highways standards 400 unless otherwise specified..

C. Place asphalt on the same day as applying tack coat.

D. Place asphalt to compacted thickness noted on plans.

E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.07 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Place asphalt binder course within 24 hours of applying primer or tack coat.

B. Place asphalt binder course to compacted thickness shown on plan.

C. Place asphalt wearing course within two hours of placing and compacting binder course.

D. Place asphalt wearing course to compacted thickness shown on plan.

E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.08 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 as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
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

3.09 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.

1. Tack coat faces of excavation and allow to cure before paving.
2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

B. Leveling Course: Install and compact leveling course consisting of dense-graded, 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 thick.

C. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch (6 mm). Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

D. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or Portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface.

1. Allow tack coat to cure undisturbed before paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.10 CURBS Refer to Section 32 1313

3.11 PAVEMENT MARKING Refer to Section 32 1723

3.12 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch (6 mm) measured with 10 foot (3 m) straight edge.

B. Compacted Thickness: Within 1/4 inch (6 mm) of specified or indicated thickness.

C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements

3.13 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.14 DISPOSAL

A. Except for material indicated to be recycled, if any, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

B. Do not allow excavated materials to accumulate on-site

3.15 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for three (3) days or until surface temperature is less than 140 degrees F (60 degrees C).

END OF SECTION

CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and Division 01 General Requirements apply to this section.

1.02 SUMMARY

A. This Section includes exterior cement concrete pavement the following:

1. Curbs.
2. Walkways.
3. Slabs-on-grade.
4. Watermain concrete encasement.

B. Related Sections include other Division 2 Sections.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.04 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

9. Detectable warning strips.

D. Field quality-control test reports.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.06 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.02 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.03 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

C. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.04 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type I or II gray.

B. Normal-Weight Aggregates: ASTM C 33, Class [4S] [4M] coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.

2.05 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

1. Available Products:

a. Axim Concrete Technologies; Cimfilm.
b. Burke by Edeco; BurkeFilm.
c. ChemMasters; Spray-Film.
d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
e. Dayton Superior Corporation; Sure Film.
f. Euclid Chemical Company (The); Eucobar.
g. Kaufman Products, Inc.; Vapor Aid.
h. Lambert Corporation; Lambco Skin.
i. L&M Construction Chemicals, Inc.; E-Con.
j. MBT Protection and Repair, ChemRex Inc.; Confilm.
k. Meadows, W. R., Inc.; Sealtight Evapre.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
n. Sika Corporation, Inc.; SikaFilm.
o. Symons Corporation; Finishing Aid.
p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

1. Available Products:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. Burke by Edoko; Aqua Resin Cure.
c. ChemMasters; Safe-Cure Clear.
d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
f. Euclid Chemical Company (The); Kurez DR VOX.
g. Kaufman Products, Inc.; Thinfilm 420.
h. Lambert Corporation; Aqua Kure-Clear.
i. L&M Construction Chemicals, Inc.; L&M Cure R.
j. Meadows, W. R., Inc.; 1100 Clear.
k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
l. Symons Corporation; Resi-Chem Clear.
m. Tamms Industries Inc.; Horncure WB 30.
n. Unitex; Hydro Cure 309.
o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
p. Tamms Industries, Inc.; Horncure 200-W.
q. Unitex; Hydro White.
r. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.

2.06 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.07 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4,000 psi (20.7 MPa).
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45
3. Slump Limit: 4” (100 mm) plus or minus 1 inch (25 mm).

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use plasticizing and retarding admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
2. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) require correction according to requirements in Section 31 20 00 "Earth Moving."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.02 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

3.05 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 30 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch (6-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Engineer.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

N. When adjoining pavement sections are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

O. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.07 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.08 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.09 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports at contractor's expense.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name

and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 1313

SECTION 321413
PRECAST CONCRETE UNIT PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-interlocking concrete paver units.

B. Sand setting bed.

C. Polymeric sand joint filler.

D. Edge restraints.

1.2 REFERENCE STANDARDS

A. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.

B. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide characteristics of paver unit, dimensions, and special shapes.

C. Product Data: Provide characteristics of polymeric sand, including base material, additive(s), compressive strength, and color.

D. Samples: Submit two samples of each paver type, illustrating style, size, color range and surface texture of units being provided.

E. Manufacturer's Installation Instructions: Indicate substrate requirements and installation methods.

F. Maintenance Materials: Provide the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Pavers: 10 of each type and size.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Non-interlocking Concrete Pavers: The design is based on the following product: Nicolock Paver-shield Pavers, Stone Ridge XL; www.nicolock.com .
   1. An approved equal.
   2. Substitutions: See Section 016000 - Product Requirements.

2.2 MATERIALS

A. Non-interlocking Pavers: Precast concrete.
   1. Compressive Strength: Minimum of 7200 pounds per square inch.
   2. Absorption: 5 percent average, with maximum of 7 percent.
   3. Air Entrainment: 5 to 7 percent.
   4. Size: 9 inch by 9 inch, 9 inch by 18 inch, and 18 inch by 18 inch, as indicated on drawings.
   5. Thickness: 2 inches.
   6. Color: Selected from manufacturer's full range.

B. Sand for Setting Bed: Clean washed natural sand or crushed stone complying with gradation requirements of ASTM C33/C33M for fine aggregates.

C. Polymeric Sand: Fine sand complying with ASTM C144 combined with polymer binders for creating semi-solid joints between pavers.
   1. Material: Granite.
   2. Additive(s): Portland Cement.
   3. Compressive Strength: 750 pounds per square inch.
   4. Adhesion by Tensile Load: 100 pounds per square inch.
   5. Color: Black.

D. Edging: Formed galvanized steel, as detailed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate is level or to correct gradient, smooth, capable of supporting pavers and imposed loads, and ready to receive work of this Section.

B. Verify gradients and elevations of substrate are correct.

C. Verify that pavers are completely dry prior to polymeric sand installation.

3.2 INSTALLATION OF SOLID PAVER UNITS

A. Spread sand bedding evenly over prepared substrate surface to a maximum thickness of 1-1/2 inch.

B. Dampen and roller compact sand to level and even surface.

C. Screed and scarify top 1 inch to 1 1/2 inch of sand.

D. Place paver units in pattern as shown on plans, parallel to building walls.

E. Cut paver units at edges with masonry saw.

F. Place half units at edge and interruptions. Maintain tight joints.

G. Spread polymeric sand uniformly over surface. Use a push broom to fill joints and remove

excess while not sweeping long distances. Sweep all excess with a fine bristle brush and remove residues with a leaf blower.

H. Tamp and level paver units with mechanical vibrator until units are firmly bedded, level, and to correct elevation and gradients. Do not tamp unrestrained edges.

I. Using a sprayer set to shower, apply water on specific areas between 100 square feet and 500 square feet to a depth of 1 1/2 inches. Complete one section at a time and avoid flooding the pavers.

3.3 CLEANING

A. Do not clean pavers until pavers and mortar are dry.

B. Clean soiled surfaces using cleaning solution. Do not harm pavers, joint materials, or adjacent surfaces.

C. Use non-metallic tools in cleaning operations.

D. Rinse surfaces with clean water.

E. Broom clean paving surfaces. Dispose of excess sand.

3.4 PROTECTION

A. Do not permit traffic over unprotected paver surface.

END OF SECTION

SECTION 323119
DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Decorative aluminum fences.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 312316 - Excavation.

1.3 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

B. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets; 2016 (Reapproved 2023).

C. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2024.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

D. Manufacturer's Installation Instructions: Indicate installation requirements, including post foundation anchor bolt templates.

E. Manufacturer's Warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.8 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Decorative Metal Fences and Gates:
1. Sleekfence; Privacy Panels; www.sleekfence.com.
2. An approved equal
3. Substitutions: See Section 016000 - Product Requirements.

B. Specialty Hardware:
1. DAC Industries, Inc; Detex Exit Bar Advantex 10xW Series: www.dacindustries.com.

2.2 FENCES

A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:
1. Capable of resisting vertical load, horizontal load and infill performance requirements for fence categories defined in ASTM F2408.

B. Electro-Deposition Coating: Multistage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
1. Total Coating Thickness: 2 mils, minimum.

C. Aluminum: ASTM B221.
1. Tubular Pickets, Rails and Posts: 6005-T5 alloy.
2. Extrusions for Posts and Rails (Outer Channel): 6005-T5 alloy.
3. Extrusions for Pickets and Rail (Inner Slide Channels): 6063-T5 alloy.

D. Fasteners:ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.

E. Hinges: Finished to match fence components.

1. Closing: Manual.

2.3 ALUMINUM FENCE

A. Decorative Aluminum Privacy Fence and Swinging Gates:
   1. Fence Panels: Formed aluminum sheets; 5 feet high by 6 feet long.
      a. Panel Style: Board-on-board.
      b. Attach panels to posts with manufacturer's standard panel brackets and recommended fasteners.
   2. Posts: Aluminum extrusions; 4 inches square.
   3. Color: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set fence posts in accordance with the manufacturer recommended spacing.

C. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
   1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.
   2. Identify the necessary hardware required for the application on the manufacturer's gate drawings.

D. Excavate post holes in accordance with Section 312316.

3.2 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From Indicated Position: 1 inch.

C. Minimum Distance from Property Line: 6 inches.

3.3 CLEANING

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

B. Clean fence with mild household detergent and clean water rinse well.

END OF SECTION

EXTERIOR PLANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Trees.

2. Shrubs.

3. Ground cover.

B. Related Sections include other Division 2 Sections.

1.03 DEFINITIONS

A. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than sizes indicated; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1, “American Standard for Nursery Stock”.

B. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1, “American Standard for Nursery Stock”, for kind, type, and size of exterior plant required.

C. Finish Grade: Elevation of finished surface of planting soil.

D. Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

E. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

1.04 SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Planting Schedule: Indicating anticipated planting dates for exterior plants.

C. Weed Barrier: Product cut sheet and sample.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when exterior planting is in progress.

B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

D. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock".

E. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

F. Observation: Engineer/Landscape Architect may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Engineer/Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Engineer/Landscape Architect of sources of planting materials seven days in advance of delivery to site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not prune trees and shrubs before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

B. Handle planting stock by root ball.

C. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.

2. Do not remove container-grown stock from containers before time of planting.

3. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.07 COORDINATION

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: April 1 to June 1.

2. Fall Planting: September 1 to October 15.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

C. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to Engineer/Landscape Architect.

1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

1.08 WARRANTY

A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.

1. Warranty Period for Trees and Shrubs: One year from date of substantial completion.

2. Warranty Period for Ground Cover and Plants: One year from date of substantial completion.

3. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.

4. Replace exterior plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

1.09 MAINTENANCE

A. Trees and Shrubs: Maintain for the following maintenance period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.

1. Maintenance Period: Twelve months from date of substantial completion.

B. Ground Cover and Plants: Maintain for the following maintenance period by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings:

1. Maintenance Period: Twelve months from date of substantial completion.

PART 2 - PRODUCTS

2.01 TREE AND SHRUB MATERIAL

A. General: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement. All plant materials shall be non-invasive.

B. Grade: Provide trees and shrubs of sizes and grades complying with ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Engineer/Landscape Architect, with a proportionate increase in size of roots or balls.

C. Label each tree with securely attached, waterproof tag bearing legible designation of botanical and common name.

D. Label at least one shrub of each variety in a group with a securely attached, waterproof tag bearing legible designation of botanical and common name.

E. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

2.02 SHADE AND FLOWERING TREES

A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.

1. Provide balled and burlapped trees.
2. Branching Height: One-third to one-half of tree height.

B. Small Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Stem Form: Single stem.
2. Provide balled and burlapped specimens.

C. Multistem Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Stem Form: Clump.
2. Provide balled and burlapped specimens.

2.03 DECIDUOUS SHRUBS

A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.

1. Provide balled and burlapped and/or container-grown specimens as designated in the plant list.

2.04 CONIFEROUS EVERGREENS

B. Form and Size: Normal-quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.

C. Form and Size: Specimen-quality, exceptionally heavy, tightly knit, symmetrically shaped coniferous evergreens and the following grade:

1. Provide balled and burlapped specimens as designated in the plant list.

2.05 BROADLEAF EVERGREENS

A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.

1. Provide balled and burlapped and/or container-grown specimens as designated in the plant list.

2.06 GROUND COVER PLANTS

A. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1.

2.07 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.08 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.

C. Aluminum Sulfate: Commercial grade, unadulterated.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.09 ORGANIC SOIL AMENDMENTS

F. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch (19-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

G. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.

H. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.10 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

2.11 MULCHES

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Ground or shredded bark or bark chips.

2.12 STAKES AND GUYS

A. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches (50 by 50 mm) by length indicated, pointed at one end.

B. Guy and Tie Wire: ASTM A 641/A 641M, Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch (2.7 mm) in diameter.

C. Guy Cable: 5-strand, 3/16-inch- (4.8-mm-) diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches (75 mm) long, with two 3/8-inch (10-mm) galvanized eyebolts.

D. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch (13 mm) in diameter, black, cut to lengths required to protect tree trunks from damage.

E. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

2.13 MISCELLANEOUS PRODUCTS

A. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inch- (100-mm-) wide minimum, with stretch factor of 33 percent.

B. Landscape Weed Control Fabric: Non-woven polypropylene, brown, 3.5 oz, 20 year.

C. Anchoring pins: 8” x 2” x 8” galvanized steel.

2.14 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with the soil amendments and fertilizer as recommended by the qualified soil testing laboratory.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain owners acceptance of layout before planting. Make minor adjustments as required.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

3.03 PLANTING BED ESTABLISHMENT

A. Loosen subgrade of planting beds to a minimum depth of 6 inches (150 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

B. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Restore planting beds if eroded or otherwise disturbed after finish grading and before planting.

3.04 TREE AND SHRUB EXCAVATION

A. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.

1. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.

B. Subsoil removed from excavations may not be used as backfill.

C. Obstructions: Notify Engineer/Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

D. Drainage: Notify Engineer/Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.05 TREE AND SHRUB PLANTING

A. Set balled and burlapped stock plumb and in center of pit or trench with top of root ball 1 inch (25 mm) above adjacent finish grades.

1. Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.

2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

B. Set container-grown stock plumb and in center of pit or trench with top of root ball [flush with] adjacent finish grades.

1. Carefully remove root ball from container without damaging root ball or plant.

2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

C. Organic Mulching: Apply 3-inch (75-mm) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of planting pit or trench. Do not place mulch within 3 inches (75 mm) of trunks or stems.

D. Wrap trees of 2-inch (50-mm) caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping.

3.06 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs as directed by Engineer/Landscape Architect.

B. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by Engineer/Landscape Architect, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning.

3.07 GUYING AND STAKING

C. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend at least 72 inches (1830 mm) above grade. Set vertical stakes and space to avoid penetrating root balls or root masses. Support trees with two strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree. Use the number of stakes as follows:

1. Use 2 stakes for trees up to 12 feet (3.6 m) high and 2-1/2 inches (63 mm) or less in caliper; 3 stakes for trees less than 14 feet (4.2 m) high and up to 4 inches (100 mm) in caliper. Space stakes equally around trees.

3.08 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants as indicated.

B. Dig holes large enough to allow spreading of roots, and backfill with planting soil.

C. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

E. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.09 PLANTING BED MULCHING

A. Mulch backfilled surfaces of planting beds and other areas indicated.

1. Organic Mulch: Apply 3-inch (75-mm) average thickness of organic mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.

3.10 CLEANUP AND PROTECTION

A. During exterior planting, keep adjacent pavings and construction clean and work area in an orderly condition.

B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.

3.11 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 32 9000

TURFS AND GRASSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements and Section 01 50 00 Temporary Facilities and Controls apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Seeding.

2. Meadow grasses and wildflowers.

B. Related Sections include Section 01 50 00 Temporary Facilities and Controls for Temporary Seeding.

1.03 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

C. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.04 SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

B. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.

C. Qualification Data: For landscape Installer.

D. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn and meadow establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

C. Pre-installation Conference: Conduct pre-installation conference at the Site per Division 01 General Requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.07 SCHEDULING

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Planting: April 1 to September 15 or as approved by Engineer.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.08 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Seeded Lawns: 60 days from date of Substantial Completion.

a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches (100 mm).

1. Water lawn at a minimum rate of 1 inch (25 mm) per week.

D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-

leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow grass 1 to 2 inches (25 to 50 mm) high.

E. Lawn Post-fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to lawn area.

1.09 MEADOW MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until acceptable meadow is established, but for not less than 40 days from date of Substantial Completion.

B. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch.

C. Watering: Provide lawn-watering equipment to convey water from sources and to keep meadow uniformly moist.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.

2. Water meadow at a minimum rate of 1/2 inch (13 mm) per week for 6 weeks after planting.

PART 2 - PRODUCTS

2.01 SEED

A. Seed Species:

1. Seed Mix #1 (Lawn Areas)

a. Provide seed mix at a rate of 100 pounds per acre containing the following mixture:

1) Kentucky Bluegrass (20%).

2) Creeping Red Fescue (40%).

3) Perennial Ryegrass (20%).

4) Annual Ryegrass (20%).

2. Seed Mix #2 (Meadow Areas)

a. Provide Showy Northeast Native Wildflower & Grass Mix (ERNMX-153) at a rate of 20 pounds per acre as provided by Ernst Conservation Sees, Inc. or approved equal.

2.02 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from agricultural land, bogs or marshes.

2.03 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.

C. Aluminum Sulfate: Commercial grade, unadulterated.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Sand: Clean, washed, natural or manufactured, free of toxic materials.

2.04 ORGANIC SOIL AMENDMENTS

A. Compost is a widely used bulk organic soil amendment and a recycled product. Because it is applied at much greater rates than fertilizer, compost has a significant cumulative effect on nutrient availability and may reduce or eliminate initial fertilization.

B. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through [3/4-inch (19-mm)] sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

C. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.

D. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.05 PLANTING ACCESSORIES

A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.06 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.07 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.08 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: per Section 01 50 00 Temporary Facilities and Controls.

2.09 PLANTING SOIL MIX

A. Planting Soil Mix: Mix topsoil with soil amendments and fertilizers recommended by the qualified soil testing laboratory.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding overspray.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.03 LAWN PREPARATION

A. Limit lawn subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

2. Spread planting soil mix to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.

D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.04 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Sow seed at the rate of 3 to 4 lb/1000 sq. ft. (1.4 to 1.8 kg/92.9 sq. m).

C. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

3.05 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with nonasphaltic tackifier.

2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply mulch at a minimum rate of 1500-lb/acre (15.3-kg/92.9 sq. m) dry weight but not less than the rate required to obtain specified seed-sowing rate.

3.06 SATISFACTORY LAWNS

A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).

B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.07 MEADOW

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

B. Sow seed at the net rate as recommended by manufacturer.

C. Brush seed into top 1/16 inch (1.6 mm) of topsoil, roll lightly, and water with fine spray.

D. Water newly planted areas and keep moist until meadow is established.

3.08 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

C. Remove erosion-control measures after grass establishment period.

END OF SECTION 32 9200

SANITARY SEWERAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements, Section 31 20 00 Earth Moving, Section 31 23 33 Trenching and Backfilling, and Section 31 50 00 Excavation Support and Protection.

1.02 SUMMARY

A. This Section includes sanitary sewerage outside the building.

1.03 DEFINITIONS

A. PE: Polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

1.04 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

B. Pressure rated pipe and fittings, 200 psi pressure rating.

1.05 SUBMITTALS

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:

1. Precast concrete tanks and manholes, including cast iron frames and covers.

2. Pipe and fittings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 General Requirements.

B. Do not store plastic structures, pipe, and fittings in direct sunlight.

C. Protect pipe, pipe fittings, and seals from dirt and damage.

D. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.07 PROJECT CONDITIONS

E. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

F. Locate existing structures and piping to be closed and abandoned.

G. 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 Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.

PART 2 - PRODUCTS

2.01 PIPES AND FITTINGS

A. PVC Sewer Pipe and Fittings: According to the following:

1. PVC Sewer Pipe and Fittings, NPS 12 (DN375) and Smaller: ASTM D 3034, SDR-35, for solvent-cemented joints or gasketed joints.

   a. Gaskets: ASTM F 477, elastomeric seals.

2. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 2241, SDR 21, for solvent-cemented or gasketed joints.

   a. Gaskets: ASTM F 477, elastomeric seals.

B. Ductile-Iron Pipe and Fittings:

1. Restrained joint pipe shall be ductile iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11 "Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings". Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50 "Thickness Design of Ductile-Iron Pipe" Class 52.

2. Restrained joint fittings and the restraining components shall be ductile iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10 and/or C153/A21.53. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11.

3. Restrained joint pipe and fittings shall be U.S. Pipe's Tyton Joint Pipe with Field Lok 350 gaskets or approved equal.

4. Cement mortar lining and seal coating for pipe and fittings shall be in accordance with ANSI/AWWA C104/A21.4 Asphaltic outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 for fittings.

5. Restrained push-on joints for pipe and fittings shall be designed for a water working pressure of 350 psi for sizes 4-inch through 24-inch.

6. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly.

2.02 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.

1. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
2. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
3. Bands: Stainless steel, at least one at each pipe insert.

B. Pipe and Tube Fittings:

1. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Units have 2 gasketed ball-joint sections and 1 or more gasketed sleeve sections. Include 250-psig (1725-kPa) minimum working-pressure rating; epoxy, interior coating according to AWWA C550; length for offset and expansion indicated; and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
2. Ductile-Iron, Deflection Fittings: Compound coupling fitting with sleeve and flexing sections, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include 250-psig (1725-kPa) minimum working-pressure rating; cement- mortar lining or epoxy, interior coating according to AWWA C550; deflection of at least 20 degrees (0.34 radians); and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
3. Ductile-Iron Fittings for PVC Pipe: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type; push-on- or mechanical-joint type. Include dimensions matching PVC pipe, cement-mortar lining and seal coat according to AWWA C104, and rubber compression gaskets according to AWWA C111.
4. Mechanical joint restraining glands shall be “megalug 2000 PV” as manufactured by Ebaa Iron Sales, Inc. or approved equal.

2.03 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48 inches (1200 mm) minimum, unless otherwise indicated. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 5-inch (125-mm) minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
3. Riser Sections: 5-inch (125-mm) minimum thickness, and lengths to provide depth indicated.

4. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Gaskets: ASTM C 443 (ASTM C 443M), rubber.
6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229- mm) total thickness, that match 24-inch- (610-mm-) diameter frame and cover.
7. Steps: Fiberglass individual steps. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12-inch (300-mm) intervals.
8. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.
9. Shall be designed for H-20 loading.

B. Manhole Frames and Covers: ASTM A -48, Class 35B, gray iron castings designed for heavy- duty service. Include 22⅜-inch ID by 6-inch (150-mm) riser with 4-inch (100-mm) minimum width flange, and 24-inch- diameter cover. Include indented top design with lettering "SEWER" cast into cover.

2.04 CONCRETE

A. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 400), deformed steel.

B. Structure Channels and Benches: Factory or field formed from concrete. Portland cement de- sign mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

   a. Invert Slope: 2 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

   a. Slope: 4 percent.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with

1. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 5-inch (125-mm) minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
3. Riser Sections: 5-inch (125-mm) minimum thickness, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Gaskets: ASTM C 443 (ASTM C 443M), rubber.

6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229- mm) total thickness, that match 24-inch- (610-mm-) diameter frame and cover.
7. Steps: Fiberglass individual steps. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12-inch (300-mm) intervals.
8. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.
9. Shall be designed for H-20 loading.

D. Manhole Frames and Covers: ASTM A -48, Class 35B, gray iron castings designed for heavy- duty service. Include 22⅜-inch ID by 6-inch (150-mm) riser with 4-inch (100-mm) minimum width flange, and 24-inch- diameter cover. Include indented top design with lettering "SEWER" cast into cover.

2.05 CONCRETE

A. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 400), deformed steel.

B. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

   a. Invert Slope: 2 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

   a. Slope: 4 percent.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 400), deformed steel.

2.06 PROTECTIVE COATINGS

A. Description: One-coat, coal-tar epoxy; 15-mil (0.38-mm) minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:

1. Concrete Manholes: On exterior surface.

2.07 CLEANOUTS

A. PVC Cleanouts: PVC body with PVC threaded cap. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping. Cleanout to be encased in minimum 6" I.D. Valve box cover with "sewer" stamped on cover.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 Earth Moving and Section 31 23 33 Trenching and Backfilling.

3.02 IDENTIFICATION

A. Materials and their installation are specified in Section 31 20 00 Earth Moving for installing green warning tape directly over piping buried 18" from finished grade.

3.03 PIPING APPLICATIONS

A. General: Include watertight joints.

B. Gravity-Flow Piping: Use the following:

1. NPS 4, NPS 6 and NPS 8 (DN100 and DN200): PVC, SDR 35, sewer pipe and fittings; solvent- cemented joints; or gaskets and gasketed joints.

3.04 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:

   a. Sleeve type to join piping, of same size, or with small difference in OD.
   b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.

2. Use the following pipe couplings for pressure applications:

   a. Sleeve type solvent cement of same size.

B. Special Pipe Fittings: Use where indicated.

3.05 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

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. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use 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.

E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.06 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: With rubber gaskets according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook." Use gaskets that match class of pipe and fittings.

C. DIP Piping, Gasketed Joints: Use joining materials according to ANSI/AWWA C111/A21.11. Construct joints with elastomeric seals and lubricant according to AWWA C600 or AWWA M41 and pipe manufacturer’s written instructions.

D. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.

E. PVC Sewer Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
2. Join profile sewer pipe fittings with gaskets according to ASTM D 2321 and manufacturer's written instructions.
3. Install according to ASTM D 2321.
4. Join pipe with solvent cement fittings according to ASTMD 2855.

F. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

G. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.07 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet. Channels shall be Trowel finished with smooth surface, benches shall have a broom finish.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3" above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

3.08 CLEANOUT INSTALLATION

A. Set cleanout frames and covers flush with surrounding grade or as indicated on plans.

B. Set cleanout frames and covers in pavement areas with tops flush with pavement surface.

3.09 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

B. 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 (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

C. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN100 to DN500). Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

D. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.10 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses.

1. Place plug in end of incomplete piping at end of day and when work stops.
2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than 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 95 percent of piping diameter.
    c. 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. Re-inspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or re- paired, for leaks and defects.

1. Do not put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate reports for each test.
5. Manholes and Sanitary Sewerage: Perform manhole vacuum testing in accordance with the latest revision of ASTM C1244-02. Perform low-pressure air testing of piping in accordance with the latest revision of ASTM F1417-92, Section 8.2.2, Time-Pressure Drop Method for a 0.5 psi drop.
6. Sewer Forcemain: Perform pressure and leakage test hydrostatically. Each forcemain test shall be for a minimum of 2 hours and at a minimum test pressure of 1.5 times operation pressure or 50 psi, whichever is greater. Allowable leakage for each forcemain is 0.5 gallons per 1,000 feet for 30 minutes.

END OF SECTION 33 3000

STORM UTILITY DRAIN PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Division 01 General Requirements, Section 31 20 00 Earth Moving, Section 31 23 33 Trenching and Backfilling, and Section 31 50 00 Excavation Support and Protection.

1.02 SUMMARY

A. This Section includes storm drainage as shown on the project drawings.

1.03 DEFINITIONS

A. HDPE: High-Density Polyethylene plastic.

B. PVC: Polyvinyl chloride plastic.

1.04 SUBMITTALS

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:

1. Precast concrete inlets, catch basins, and other structures, including frames, covers, and grates.

2. Drainage Piping.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Division 01 Requirements.

B. Do not store plastic structures, pipe, and fittings in direct sunlight.

C. Protect pipe, pipe fittings, and seals from dirt and damage.

D. Handle precast concrete inlets and other structures according to manufacturer's written rigging instructions.

1.06 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.02 PIPES AND FITTINGS

A. Corrugated PE Drainage Tubing and Fittings: AASHTO M 252, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 252, corrugated, matching tube and fittings to form soiltight joints.

B. Corrugated PE Pipe and Fittings: AASHTO M 294, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 294, corrugated, matching pipe and fittings to form soiltight joints.

C. PVC Type PSM Solid and Perforated Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends
3. Gaskets: ASTM F 477, elastomeric seals
4. Perforations: ASTM F758 / AASHTO M278 Hole Pattern

2.03 STORMWATER INLETS

A. Yard Drain Inlets: Made with horizontal gutter opening, of materials and dimensions according to the project drawings. Include heavy-duty frames and grates.

B. Catch Basins: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to project drawings. Include heavy-duty frames and grates.

C. Drain Inlets: Made with horizontal gutter opening, of materials and dimensions according to the project drawings. Include heavy-duty frames and grates.

D. Frames and Grates: Dimensions, opening pattern, free area, and other attributes as indicated on the project drawings.

1. Material: ASTM A 536, Grade 60-40-18 minimum, ductile-iron casting.

2.04 CONCRETE

A. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.

2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, (Grade 420) deformed steel.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 Earth Moving and Section 31 23 33 Trenching and Backfilling.

3.02 PIPING APPLICATIONS

A. General: Include watertight, silttight, or soiltight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:

1. NPS 4 and NPS 6 (DN100 and DN150): Corrugated PE drainage tubing and fittings, silttight couplings, and coupled joints.
2. NPS 8 to NPS 15 (DN200 to DN375): Corrugated PE drainage tubing and fittings, soiltight couplings, and coupled joints in NPS 8 and NPS 10 (DN200 and DN250). Use corrugated PE pipe and fittings, soiltight couplings, and coupled joints in NPS 12 and NPS 15 (DN300 and DN375).

3.03 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:

a. Sleeve type to join piping, of same size, or with small difference in OD.
b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.

3.04 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

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 use of lubricants, cements, and other installation requirements.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use 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.

E. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

F. PE Pipe and Fittings: As follows:
   1. Join Pipe, tubing, and fittings with couplings for soiltight joints according to manufacturer’s written instructions.
   2. Install according to ASTM D 2321 and manufacturer’s written instructions.
   3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association’s “Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings”.

G. System Piping Joints: Make joints using system manufacturer’s couplings, unless otherwise indicated.

H. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems’ materials and dimensions.

3.05 STORMWATER INLET INSTALLATION

A. Construct inlets to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.06 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses.

   1. Place plug in end of incomplete piping at end of day and when work stops.
   2. Flush piping between inlets and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports 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. 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.

C. 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 authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate reports for each test.

END OF SECTION 33 4200

SECTION 990001
APPENDIX COVER 'A'

PEARL RIVER PUBLIC LIBRARY

80 Franklin Avenue
Pearl River, NY 10965

APPENDIX 'A'
PREVAILING WAGE SCHEDULE

END OF SECTION

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Pearl River Public Library

Brett Huttman, Senior Architect
333 Westchester Avenue
White Plains NY 10604

Schedule Year	2023 through 2024
Date Requested	12/04/2023
PRC#	2023014118

Location	Pearl River Public Library
Project ID#	2578-02
Project Type	The existing library will be fully renovated, including architectural, mechanical, plumbing, fire alarm, and fire sprinkler work.

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 2023 through June 2024. 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 12226

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.

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 12226; 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, contemperaneous, 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 12226 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

Pearl River Public Library

Brett Huttman, Senior Architect
333 Westchester Avenue
White Plains NY 10604

Schedule Year 2023 through 2024
Date Requested 12/04/2023
PRC# 2023014118

Location	Pearl River Public Library
Project ID#	2578-02
Project Type	The existing library will be fully renovated, including architectural, mechanical, plumbing, fire alarm, and fire sprinkler work.

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: $_____

Approximate Starting Date: ____/____/____

Approximate Completion Date: ____/____/____

Contract Type:
- [ ] (01) General Construction
- [ ] (02) Heating/Ventilation
- [ ] (03) Electrical
- [ ] (04) Plumbing
- [ ] (05) Other : _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

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

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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 12226

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.

NEW YORK STATE OF OPPORTUNITY. Department of Labor

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)

WE ARE YOUR DOL

NEW YORK STATE Department of Labor

New York State Department of Labor
Bureau of Public Work

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.

Your pay stub and wage notice received upon hire must clearly state your wage rate and supplement rate.

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/bureau-public-work

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) 568-5287		

* 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 of 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 requirement s 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 that 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 12226

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

Rockland County General Construction

Boilermaker — 12/01/2023

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:

	07/01/2023	01/01/2024
Boilermaker	$ 65.88	$ 67.38
Repairs & Renovations	65.88	67.38

Repairs & Renovation: Includes Repairing, Renovating replacement of parts to an existing unit(s).

SUPPLEMENTAL BENEFITS
Per Hour:

Boilermaker	33.5% of hourly Wage Paid + $ 26.49	33.5% of Hourly Wage Paid + $26.85
Repair $ Renovations		

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 (*B, O, **U) on OVERTIME PAGE
Note:* Includes 9th & 10th hours, double for 11th or more.
** Labor Day ONLY, if worked.

Repairs & Renovation see (B,E,Q) on OT Page

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 12, 15, 25, 26, 29) on HOLIDAY PAGE

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)	33.5% of Hourly Wage Paid Plus Amount Below	33.5% of Hourly Wage Paid Plus Amount Below
1st Term	$ 20.12	$ 20.36
2nd Term	21.03	21.28
3rd Term	21.95	22.22
4th Term	22.83	23.12
5th Term	23.76	24.07
6th Term	24.67	25.00
7th Term	25.58	25.93

NOTE: "Hourly Wage Paid" shall include any and all premium(s)

4-5

Carpenter — 12/01/2023

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2023

Piledriver	$ 59.16 + 9.79*
Dockbuilder	$ 59.16 + 9.79*

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 45.34

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
$25.60 + 5.30*	$31.20 + 5.30*	$39.58 + 5.30*	$47.97 + 5.30*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:

All Terms: $ 31.83

8-1556 Db

Carpenter — 12/01/2023

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2023

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:
$ 39.45

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
$ 25.20	$ 28.20	$ 32.45	$ 40.33

	+ 1.85*	+ 2.35*	+ 2.85*	+ 3.85*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 15.22	$ 16.22	$ 19.32	$ 20.32

8-2287

Carpenter **12/01/2023**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour: 07/01/2023

Marine Construction:

Marine Diver	$ 74.03
	+ 9.79*
Marine Tender	$ 53.57
	+ 9.79*

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 45.34

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	$ 25.60
	+ 5.30*
2nd year	31.20
	+ 5.30*
3rd year	39.58
	+ 5.30*
4th year	47.97
	+ 5.05*

*This portion is not subject to overtime premiums

Supplemental Benefits
Per Hour:

All terms	$ 31.83

8-1456MC

Carpenter **12/01/2023**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2023

Building
Millwright $ 58.70
+ 12.62*

*This portion is not subject to overtime premiums

SUPPLEMENTAL BENEFITS
Per hour:

Millwright $ 44.31

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.
$31.74 + 6.75*	$37.19 + 7.92*	$42.64 + 9.09*	$53.54 + 11.43*

*This portion is not subject to overtime premiums

Supplemental benefits per hour:
One (1) year terms:

1st.	2nd.	3rd.	4th.
$29.81	$32.34	$35.52	$39.94

8-740.1

Carpenter 12/01/2023

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: 07/01/2023

Core Drilling:
Driller $ 43.88
+ 2.50*

Driller Helper $ 34.47
+ 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 $ 28.85

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 — 12/01/2023

JOB DESCRIPTION Carpenter - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Putnam, Rockland, Westchester

WAGES
WAGES:(per hour)
Applies to CAPRENTER BUILDING/HEAVY & HIGHWAY/TUNNEL:

	07/01/2023	07/01/2024 Additional	07/01/2025 Additional	07/01/2026 Additional
Base Wage	$ 39.80 +$6.71*	$ 1.25**	$ 1.25**	$ 1.25**

*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 $ 33.22

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
$ 19.90 +3.58*	$ 23.88 +3.58*	$ 25.87 +3.58*	$ 27.86 +3.58*	$ 31.84 +3.58*

*For all hours paid straight or premium

SUPPLEMENTAL BENEFITS per hour:

All terms $ 16.27

11-279.1B/HH

Electrician — 12/01/2023

JOB DESCRIPTION Electrician **DISTRICT** 11

ENTIRE COUNTIES
Orange, Putnam, Rockland

PARTIAL COUNTIES
Dutchess: Towns of Fishkill, East Fishkill, and Beacon.

WAGES
Per hour:

	07/01/2023	04/01/2024
Electrician Wireman/Technician	$ 49.50	$ 50.50
	+9.00*	+ 9.50*

SHIFT DIFFERENTIAL: On Public Work in New York State when shift work is mandated either in the job specifications or by the contracting agency, the following rates apply when shift is worked:

Between 4:30pm & 12:30am	$ 58.08	$ 59.30
	+ 9.00*	+ 9.50*
Between 12:30am & 8:30am	$ 65.06	$66.35
	+ 9.00*	+ 9.50*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

NOTE ADDITIONAL AMOUNTS PAID FOR THE FOLLOWING WORK LISTED BELOW (subject to overtime premiums):
- On jobs where employees are required to work from boatswain chairs, swinging scaffolds, etc., forty (40) feet or more above the ground, or under compressed air, using Scottair packs, or gas masks, they shall receive an additional $2.00 per hour above the regular straight time rate.
- Journeyman Wireman working in Shafts, Tunnels or on Barges: $5.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman when performing welding or cable splicing: $3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a NYS Asbestos Certificate: $3.00 above the Journeyman Wireman rate of pay
- Journeyman Wireman required to have a CDL: $3.00 above the Journeyman Wireman rate of pay.

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2023	04/01/2024
Journeyman	$ 28.68 plus 3% of straight or premium wage	$ 29.68 plus 3% of straight or premium wage

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 13, 15, 16, 25) on HOLIDAY PAGE
When the holiday falls on a Saturday it is observed the Friday before. When the holiday falls on a Sunday it is observed on the Monday after.

REGISTERED APPRENTICES
WAGES:
(1)year terms at the following rates

07/01/2023	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 14.25	$ 19.00	$ 23.75	$ 28.50	$ 33.25	$ 35.63
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
2nd Shift	16.72	22.29	27.86	33.43	39.00	41.79
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
3rd Shift	18.72	24.97	31.21	37.45	43.69	46.82
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*

09/01/2023	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 15.68	$ 19.00	$ 23.75	$ 28.50	$ 33.25	$ 35.63
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
2nd Shift	18.39	22.29	27.86	33.43	39.00	41.79
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
3rd Shift	20.60	24.97	31.21	47.45	43.69	46.82
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*

04/01/2024	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 16.01	$ 19.40	$ 24.25	$ 29.10	$ 33.95	$ 36.38
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
2nd Shift	18.78	22.76	28.45	34.13	39.82	42.67
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*
3rd Shift	21.04	25.49	31.86	38.24	44.61	47.80
	+1.00*	+1.00*	+1.50*	+2.00*	+2.50*	+2.50*

09/01/2024	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 16.01	$ 19.40	$ 24.25	$ 29.10	$ 33.95	$ 36.38
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
2nd Shift	18.78	22.76	28.45	34.13	39.82	42.67
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*

3rd Shift	21.04	25.49	31.86	38.24	44.61	47.80
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
04/01/2025	1st	2nd	3rd	4th	5th	6th
1st Shift	$ 16.34	$ 19.80	$ 24.75	$ 29.70	$ 34.65	$ 37.13
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
2nd Shift	19.17	23.23	29.03	34.84	40.64	43.55
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*
3rd Shift	21.47	26.02	32.52	39.03	45.53	48.79
	+1.00*	+1.00*	+1.00*	+2.00*	+2.50*	+2.50*

*For all hours paid straight or premium, not to be included in 3% calculation for supplemental benefits.

SUPPLEMENTAL BENEFITS per hour:

07/01/2023	
1st term	$ 16.28 plus 3% of straight or premium wage
2nd term	$ 16.28 plus 3% of straight or premium wage
3rd term	$ 18.28 plus 3% of straight or premium wage
4th term	$ 18.78 plus 3% of straight or premium wage
5th term	$ 20.28 plus 3% of straight or premium wage
6th term	$ 20.28 plus 3% of straight or premium wage
09/01/2024	
1st term	$ 16.28 plus 3% of straight or premium wage
2nd term	$ 17.78 plus 3% of straight or premium wage
3rd term	$ 18.78 plus 3% of straight or premium wage
4th term	$ 19.78 plus 3% of straight or premium wage
5th term	$ 21.28 plus 3% of straight or premium wage
6th term	$ 21.28 plus 3% of straight or premium wage

11-363/1

Elevator Constructor — 12/01/2023

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:

	07/01/2023
Elevator Constructor	$ 77.49
Modernization & Service/Repair	$ 60.89

NOTE - The 'Employer Registration' (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30,2023 will expire within the granted time frame.

For Pre-Registered Projects 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. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS
Per Hour:

Elevator Constructor	$ 45.574
Modernization & Service/Repairs	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*	2nd & 3rd Term*	4th & 5th Term	6th & 7th Term	8th & 9th Term
50%	50%	55%	65%	75%

SUPPLEMENTAL BENEFITS

Elevator Constructor	
1st Term	$ 0.00
2nd & 3rd Term	36.024
4th & 5th Term	36.943
6th & 7th Term	38.448
8th & 9th Term	39.953

Modernization & Service/Repair	
1st Term	$ 0.00
2nd & 3rd Term	35.694
4th & 5th Term	36.525
6th & 7th Term	37.948
8th & 9th Term	39.38

4-1

Elevator Constructor — 12/01/2023

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	07/01/2023	01/01/2024
Mechanic	$ 67.35	$ 70.15
Helper	70% of Mechanic Wage Rate	70% of Mechanic Wage Rate

NOTE - The "Employer Registration" (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30, 2023 will expire within the granted time frame.

For Pre-Registered Projects 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. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS
Per hour

	07/01/2023	01/01/2024
Journeyperson/Helper	$ 37.335*	$ 37.885*

(*)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 Journeyperson/Helper

1-138

Glazier **12/01/2023**

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:	7/01/2023
Glazier & Glass Tinting	$ 61.64
*Scaffolding	65.64
Window Film	
**Repair & Maintenance	30.76

*Scaffolding includes swing scaffold, mechanical equipment, scissor jacks, man lifts, booms & buckets 30' or more, but not pipe scaffolding.

**Repair & Maintenance- All repair & maintenance work on a particular building whenever performed, where the total cumulative Repair & Maintenance contract value is under $184,000.

SUPPLEMENTAL BENEFITS

Per hour:	7/01/2023
Glazier & Glass Tinting	$ 40.20
Window Film	
Repair & Maintenance	23.19

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE
For 'Repair & Maintenance' 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'
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:

	7/01/2023
1st term	$ 21.93
2nd term	30.05
3rd term	39.95
4th term	48.97

Supplemental Benefits:
(Per hour)

1st term	$ 18.25
2nd term	25.97
3rd term	31.27

4th term	34.32

8-1087 (DC9 NYC)

Insulator - Heat & Frost — 12/01/2023

JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Westchester

WAGES

Per hour:	07/01/2023	06/01/2024
Insulator	$ 59.25	+ $ 2.50
Discomfort & Additional Training**	62.31	+ $ 2.50
Fire Stop Work*	31.77	+ $ 2.50

* 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	$ 37.35
Discomfort & Additional Training	39.39
Fire Stop Work:	
Journeyworker	19.03

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
$ 31.77	$ 37.26	$ 42.76	$ 48.26

Discomfort & Additional Training Apprentices:

1st	2nd	3rd	4th
$ 33.30	$ 39.09	$ 44.90	$ 50.71

Supplemental Benefits paid per hour:

Insulator Apprentices:

1st term	$ 19.03
2nd term	22.69
3rd term	26.36
4th term	30.03

Discomfort & Additional Training Apprentices:

1st term	$ 20.06
2nd term	23.92
3rd term	27.78
4th term	31.66

Ironworker **12/01/2023**

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:	07/01/2023
Reinforcing & Metal Lathing	$ 56.95
"Base" Wage	$ 55.20 plus $ 1.75

"Base" Wage is used to calculate overtime hours only.

SUPPLEMENTAL BENEFITS

Per hour:	
Reinforcing & Metal Lathing	$ 42.72

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	$ 49.47
Double Time	$ 56.22

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	$ 28.38	$ 34.68	$ 37.18
"Base" Wage			
$ 21.00 plus $1.55	$ 26.80 plus $1.58	$ 33.10 plus $1.58	$ 35.60 plus $1.58

"Base" Wage is used to calculate overtime hours ONLY.

SUPPLEMENTAL BENIFITS
Per Hour:

1st term	2nd term	3rd term	4th Term
$ 18.17	$ 21.34	$ 22.00	$ 22.50

4-46Reinf

Ironworker **12/01/2023**

JOB DESCRIPTION Ironworker **DISTRICT** 11

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster

WAGES
Per hour:

07/01/2023	07/01/2024 Additional	07/01/2025 Additional	07/01/2026 Additional

Structural	$ 52.63	$ 2.00*	$ 2.00*	$2.00*
Reinforcing*	52.63	2.00*	2.00*	2.00*
Ornamental	52.63	2.00*	2.00*	2.00*
Chain Link Fence	52.63	2.00*	2.00*	2.00*

* To be allocated at a later date.

NOTE: For Reinforcing classification ONLY, Ironworker 4-46Reinf rates apply in Rockland County's southern section (south of Convent Road and east of Blue Hills Road).

On Government Mandated Irregular Work Days or Shift Work, the following wage will be paid:

1st Shift	$ 52.63
2nd Shift	67.34
3rd Shift	72.24

**Note- Any shift that works past 12:00 midnight shall receive the 3rd shift differential.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 43.47

OVERTIME PAY
See (B1, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16) on HOLIDAY PAGE
If a holiday falls on Saturday, it will be observed Friday. If a holiday falls on Sunday, it will be observed Monday.

REGISTERED APPRENTICES
Wages:

(1) year terms at the following wage:

	1st yr	2nd yr	3rd yr	4th yr
1st Shift	$ 26.32	$ 31.58	$ 36.85	$ 42.10
2nd Shift	36.16	42.40	48.64	54.86
3rd Shift	39.45	46.00	52.57	59.12

Supplemental Benefits per hour:

1st year	$ 37.35
2nd year	38.57
3rd year	39.80
4th year	41.02

11-417

Laborer - Building — 12/01/2023

JOB DESCRIPTION Laborer - Building **DISTRICT** 11

ENTIRE COUNTIES
Rockland

WAGES
Class 1: Custodial and janitorial work, general cleanup, and flag person.

Class 2: Concrete laborer, mason tending, hod carrier, signal person, pressure blasting and washing, chainsaw, demo saw, jackhammers, general labor.

Class 3: Jumping jack, air track drills, grading, explosive handler and blaster, grade checker. When OSHA requires negative pressure respirator.

Class 4: Environmental work including but not limited to asbestos abatement, toxic and hazardous abatement, lead abatement work, mold remediation and biohazards.

WAGES: (per hour)	07/01/2023	06/01/2024 Additional	06/01/2025 Additional	06/01/2025 Additional
Class 1	$ 41.48	$ 2.51*	$ 2.60*	$ 2.69*
Class 2	44.59	2.62*	2.71*	2.81*
Class 3	45.72	2.66*	2.75*	2.85*
Class 4	46.91	2.70*	2.80*	2.89*

*To be allocated at a later date.

SHIFT DIFFERENTIAL: On all Governmental mandated or irregular or off shift work, an additional 25% of the wage will be paid hourly.

NOTE: All work five feet or more outside the building foundation line shall be deemed Heavy & Highway

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyman	$ 29.50
Shift Differential	$ 36.37

OVERTIME PAY
See (B, *E, E5, **Q) on OVERTIME PAGE
*For first 8 hours on Saturday
**When an employee is required to work on a holiday which falls on a Sunday the employee shall be paid three (3) times the hourly rate and one (1) hour benefits for every hour worked. When an employee is required to work on a holiday which falls on a Saturday the employee shall be paid two and a half (2.5) times the hourly rate and one hour benefits for every hour worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE.
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
(1000) hour terms at the following wages.

	07/01/2023	06/01/2024
1st term	$ 27.05	$ 28.05
2nd term	31.25	32.35
3rd term	35.40	36.70
4th term	39.55	41.00
Supplemental Benefits per hour:		
All Terms Regular	$ 28.50	$ 29.40
All Terms Shift Rate	35.12	TBD

11-754B

Laborer - Heavy&Highway **12/01/2023**

JOB DESCRIPTION Laborer - Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Rockland

WAGES
CLASS 1: Flagperson, gateperson.

CLASS 2: General laborer, chuck tender, nipper, powder carrier, magazine tender, concrete men, vibrator men, mason tender, mortar men, traffic control, custodial work, temporary heat, pump men, pit men, dump men, asphalt men, joint setter, signalman, pipe men, riprap, dry stone layers, jack hammer, bush hammer, pavement breaker, men on mulching & seeding machines, all seeding & sod laying, landscape work, walk behind self-propelled power saws, grinder, walk behind rollers and tampers of all types, burner men, filling and wiring of baskets for gabion walls, chain saw operator, railroad track laborers, power buggy, power brush cutter, retention liners, walk behind surface planer, chipping hammer, manhole, catch basin or inlet installing, mortar mixer, laser men. *Micropaving and crack sealing.

CLASS 3: Asbestos, toxic, bio-remediation and phyto-remediation, lead or hazardous materials abatement when certification or license is required, Drilling Equipment Only Where a Separate Air Compressor Unit Supplies Power.

CLASS 4: Asphalt screedman, blaster, all laborers involved in pipejacking and boring operations not exceeding more than 10 feet into pipe, boring or drilled area.

WAGES: (per hour)	07/01/2023	06/01/2024 Additional
Class 1	$ 43.75	$ 2.25**
Class 2	47.35	2.35**
Class 3	51.65	2.45**
Class 4	55.05	4.10**

* When laborers are performing micro paving, crack sealing or slurry application when not part of asphalt prep operations laborers shall receive an additional $2.50 per hour over rate.
** To be allocated at a later date.

SHIFT DIFFERENTIAL: Night work and irregular shift require 20% increase on wages for all Government mandated night and irregular shift work.

NOTE - The 'Employer Registration' (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30,2023 will expire within the granted time frame.

For Pre-Registered Projects 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. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyman	$ 29.38
Shift Differential	34.87

OVERTIME PAY

See (B, E, P, *R, **S, ***T, X) on OVERTIME PAGE
*For Mon-Fri Holidays, Double Benefits to be paid for all hours worked.
**For Saturday Holidays, Two and one Half Benefits for all hours worked.
***For Sunday Holidays, Triple Benefits for all hours worked.

HOLIDAY

Paid: See (5, 6, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 25) on HOLIDAY PAGE
To be eligible for a paid holiday, an employee must work at least two (2) days in the calendar week or payroll week in which the holiday falls.

REGISTERED APPRENTICES

(1000) hour terms at the following wages.

	07/01/2023	06/01/2024
1st term	$ 27.05	$ 28.05
2nd term	31.25	32.35
3rd term	35.40	36.70
4th term	39.55	41.00
Supplemental Benefits per hour:		
All Terms Regular	$ 28.50	$ 29.40
All Terms Shift Rate	33.79	TBD

11-754H/H

Laborer - Tunnel — 12/01/2023

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)

	07/01/2023	06/01/2024	06/01/2025
Class 1	$ 55.55	$ 57.05	$ 58.55
Class 2	57.70	59.20	60.70
Class 4	64.10	65.60	67.10
Class 5	47.65	49.90	51.40

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	$ 35.73	$ 36.98	$ 38.23
Benefit 2	51.01	TBD	TBD
Benefit 3	71.28	TBD	TBD

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 — 12/01/2023

JOB DESCRIPTION Lineman Electrician **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, Wyoming, Yates

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.

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.

Below rates applicable on all overhead and underground distribution and maintenance work, and all overhead and underground transmission line work and the installation of fiber optic cable where no other construction trades are or have been involved. (Ref #14.01.01)

Per hour:	07/01/2023	05/06/2024
Lineman, Technician	$ 57.40	$ 58.90
Crane, Crawler Backhoe	57.40	58.90
Welder, Cable Splicer	57.40	58.90
Digging Mach. Operator	51.66	53.01
Tractor Trailer Driver	48.79	50.07
Groundman, Truck Driver	45.92	47.12
Equipment Mechanic	45.92	47.12
Flagman	34.44	35.34

Additional $1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all electrical sub-stations, switching structures, fiber optic cable and all other work not defined as "Utility outside electrical work". (Ref #14.02.01-A)

Lineman, Technician	$ 57.40	$ 58.90
Crane, Crawler Backhoe	57.40	58.90
Cable Splicer	63.14	64.79
Certified Welder, Pipe Type Cable	60.27	61.85
Digging Mach. Operator	51.66	53.01
Tractor Trailer Driver	48.79	50.07
Groundman, Truck Driver	45.92	47.12
Equipment Mechanic	45.92	47.12
Flagman	34.44	35.34

Additional $1.00 per hour for entire crew when a helicopter is used.

Below rates apply on switching structures, maintenance projects, railroad catenary install/maintenance third rail installation, bonding of rails and pipe type cable and installation of fiber optic cable. (Ref #14.02.01-B)

Lineman, Tech, Welder	$ 58.72	$ 60.22
Crane, Crawler Backhoe	58.72	60.22
Cable Splicer	64.59	66.24
Certified Welder, Pipe Type Cable	61.66	63.23
Digging Mach. Operator	52.85	54.20
Tractor Trailer Driver	49.91	51.19
Groundman, Truck Driver	46.98	48.18
Equipment Mechanic	46.98	48.18
Flagman	35.23	36.13

Additional $1.00 per hour for entire crew when a helicopter is used.

Below rates applicable on all overhead and underground transmission line work & fiber optic cable where other construction trades are or have been involved. This applies to transmission line work only, not other construction. (Ref #14.03.01)

Lineman, Tech, Welder	$ 59.91	$ 61.41
Crane, Crawler Backhoe	59.91	61.41
Cable Splicer	59.91	61.41
Digging Mach. Operator	53.92	55.27
Tractor Trailer Driver	50.92	52.20
Groundman, Truck Driver	47.93	49.13
Equipment Mechanic	47.93	49.13
Flagman	35.95	36.85

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 %

NOTE - The "Employer Registration" (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30, 2023 will expire within the granted time frame.

For Pre-Registered Projects 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. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS

Per hour:

	07/01/2023	05/06/2024
Lineman, Technician, or Equipment Operators with Crane License	$ 29.40 *plus 7% of the hourly	$ 30.90 *plus 7% of the hourly

	wage paid	wage paid
All other Journeyman	$ 26.40 *plus 7% of the hourly wage paid	$ 26.90 *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, X) on OVERTIME PAGE. *Note* Double time for all 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:

	07/01/2023	05/06/2024
	$ 26.40 *plus 7% of the hourly wage paid	$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249a

Lineman Electrician - Teledata **12/01/2023**

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).

	07/01/2023	01/01/2024	01/01/2025
Cable Splicer	$ 37.73	$ 39.24	$ 40.81
Installer, Repairman	$ 35.81	$ 37.24	$ 38.73
Teledata Lineman	$ 35.81	$ 37.24	$ 38.73
Tech., Equip. Operator	$ 35.81	$ 37.24	$ 38.73
Groundman	$ 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:	07/01/2023	01/01/2024	01/01/2025
Journeyman	$ 5.70 *plus 3% of the hourly wage paid	$ 5.70 *plus 3% of the hourly wage paid	$ 5.70 *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 — 12/01/2023

JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting **DISTRICT** 6

ENTIRE COUNTIES
Columbia, Dutchess, Orange, Putnam, Rockland, Ulster

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/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 #14.01.02)

Per hour:	07/01/2023	05/06/2024
Lineman, Technician	$ 50.60	$ 51.82
Crane, Crawler Backhoe	50.60	51.82
Certified Welder	53.13	54.41
Digging Machine	45.54	46.64
Tractor Trailer Driver	43.01	44.05
Groundman, Truck Driver	40.48	41.46
Equipment Mechanic	40.48	41.46
Flagman	30.36	31.09

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%

NOTE - The "Employer Registration" (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30, 2023 will expire within the granted time frame.

For Pre-Registered Projects 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. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS
Per hour worked (but also required on non-worked holidays):

	07/01/2023	05/06/2024
Lineman, Technician, or Equipment Operators with Crane License	$ 29.40 *plus 7% of the hourly wage paid	$ 30.90 *plus 7% of the hourly wage paid
All other Journeyman	$ 26.40 *plus 7% of the hourly wage paid	$ 26.90 *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 all 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:

07/01/2023	05/06/2024
$ 26.40 *plus 7% of the hourly wage paid	$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249aReg8LT

Lineman Electrician - Tree Trimmer — 12/01/2023

JOB DESCRIPTION Lineman Electrician - Tree Trimmer **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, Wyoming, Yates

WAGES
Applies to line clearance, tree work and right-of-way preparation on all new or existing energized overhead or underground electrical, telephone and CATV lines. This also would include stump removal near underground energized electrical lines, including telephone and CATV lines.

Per hour:	07/01/2023	12/31/2023
Tree Trimmer	$ 29.80	$ 31.44
Equipment Operator	26.35	27.80
Equipment Mechanic	26.35	27.80
Truck Driver	21.95	23.15
Groundman	18.07	19.07

Flag person	14.20	14.20*

*NOTE- Rate effective on 01/01/2024 - $15.00 due to minimum wage increase

SUPPLEMENTAL BENEFITS
Per hour:

	07/01/2023	12/31/2023
Journeyman	$ 10.48 *plus 4.5% of the hourly wage paid	$ 10.48 *plus 4.5% 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, X) 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 (5, 6, 8, 15) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 16, 25) on HOLIDAY PAGE
NOTE: All paid holidays falling on a Saturday shall be observed on the preceding Friday.
All paid holidays falling on a Sunday shall be observed on the following Monday.

6-1249TT

Mason - Building — 12/01/2023

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Nassau, Rockland, Suffolk, Westchester

WAGES
Per hour:

	07/01/2023	12/04/2023	06/03/2024
Tile Finisher	$ 48.36	$ 48.80	Additional $ 0.59

SUPPLEMENTAL BENEFITS
Per Hour:

	$ 22.56*	$ 22.71*
	+ $9.86	+ $9.86

*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 — 12/01/2023

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Nassau, Rockland, Suffolk, Westchester

WAGES
Per hour:

	07/01/2023	12/04/2023	06/05/2024
Tile Setters	$ 62.98	$ 63.50	Additional $ 0.72

SUPPLEMENTAL BENEFITS
Per Hour:

	$ 25.61*	$25.81*
	+ $10.04	+ $10.04

* 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 1-750	2nd 751-1500	3rd 1501-2250	4th 2251-3000	5th 3001-3750	6th 3751-4500	7th 4501-5250	8th 5251-6000	9th 6001-6750	10th 6501-7000
07/01/2023	$21.70	$26.66	$33.75	$38.69	$42.25	$45.70	$49.29	$54.23	$57.09	$61.25
12/04/2023	$21.96	$26.95	$34.10	$39.08	$42.68	$46.16	$49.79	$54.77	57.66	$61.90

Supplemental Benefits per hour:

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
07/01/2023	$12.55* +$.73	$12.55* +$.78	$15.36* +$.88	$15.36* +$.88	$16.36* +$1.37	$17.86* +$1.42	$18.86* +$1.83	$18.86* +$1.88	$16.86* +$6.03	$22.11* +$6.61
12/04/2023	$12.55* +$0.73	$12.55* +$0.78	$15.63* +$0.89	$15.36* +$0.94	$16.36* +$1.38	$17.86* +$1.43	$18.86* +$1.84	$18.86* +$1.89	$16.86* +$6.04	$22.11* +$6.62

* This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52A

Mason - Building — 12/01/2023

JOB DESCRIPTION Mason - Building **DISTRICT** 11

ENTIRE COUNTIES
Putnam, Rockland, Westchester

PARTIAL COUNTIES
Orange: Only the Township of Tuxedo.

WAGES
Per hour:

	07/01/2023
Bricklayer	$ 45.89
Cement Mason	45.89
Plasterer/Stone Mason	45.89
Pointer/Caulker	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 workday is mandated or required by state, federal, county, local or other governmental agency contracts, the following premiums apply:
Irregular workday 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	$ 37.95

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 — 12/01/2023

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES
Per Hour:

	07/01/2023	7/03/2023
Marble Cutters & Setters	$ 62.82	$ 63.12

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 39.03	$ 39.34

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:
07/01/2023
750 hour terms at the following wage

1st	2nd	3rd	4th	5th	6th	7th	8th
0-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6751-7500	7500+
$ 26.42	$ 39.62	$ 42.91	$ 46.22	$ 49.52	$ 53.38	$ 59.67	$ 62.82

Supplemental Benefits per hour:
07/01/2023

1st	2nd	3rd	4th	5th	6th	7th	8th
$ 25.38	$ 28.86	$ 29.74	$ 30.60	$ 31.48	$ 36.44	$ 38.17	$ 39.03

07/03/2023
Wage Per Hour:

750 hour terms at the following wage.

1st	2nd	3rd	4th	5th	6th	7th	8th
0-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6751-7500	7500+
$ 26.60	$ 39.82	$ 43.13	$ 46.45	$ 49.78	$ 53.64	$ 59.95	$ 63.12

Supplemental Benefits Per Hour:

1st	2nd	3rd	4th	5th	6th	7th	8th
$ 25.54	$ 29.09	$ 29.97	$ 30.84	$ 31.72	$ 36.73	$ 38.48	$ 39.34

9-7/4

Mason - Heavy&Highway — 12/01/2023

JOB DESCRIPTION Mason - Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Putnam, Rockland, Westchester

PARTIAL COUNTIES
Orange: Only the Township of Tuxedo.

WAGES
Per hour:

	07/01/2023
Bricklayer	$ 46.39
Cement Mason	46.39
Marble/Stone Mason	46.39
Plasterer	46.39
Pointer/Caulker	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 workday is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:
Irregular workday 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	$ 37.95

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 / Heavy&Highway **12/01/2023**

JOB DESCRIPTION Operating Engineer - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Delaware, Orange, Rockland, Sullivan, Ulster

WAGES
CLASS A5: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with 140ft boom and over.
CLASS A4: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with 100ft to 139ft boom.
CLASS A3: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes with a boom under 100ft.
CLASS A2: Cranes, Derricks and Pile Drivers less than 100 tons with 140ft boom and over.
CLASS A1: Cranes, Derricks and Pile Drivers less than 100 tons with a 100ft to 139ft boom.

CLASS A: Cranes, Derricks and Pile Drivers less than 100 tons with a boom under 100ft.; Autograde Combination Subgrader, Base Material Spreader and Base Trimmer (CMI and Similar Types); Autograde Pavement profiler (CMI and Similar Types); Autograde Pavement Profiler and Recycle type (CMI and Similar Type); Autograde Placer-Trimmer-Spreader Comb. (CMI & Similar types); Autograde Slipform Paver (CMI & Similar Types); Central Power Plants (all types); Chief of Party; Concrete Paving Machines; Drill (Bauer, AMI and Similar Types); Drillmaster, Quarrymaster (Down the Hole Drill), Rotary Drill, Self-Propelled Hydraulic Drill, Self-Powered Drill; Draglines; Elevator Graders; Excavator; Front End Loaders (5 yds. and over); Gradalls; Grader-Rago; Helicopters (Co-Pilot); Helicopters (Communications Engineer);Juntann Pile Driver; Locomotive (Large); Mucking Machines; Pavement & Concrete Breaker, i.e., Superhammer & Hoe Ram; Roadway Surface Grinder; Prentice Truck; Scooper (Loader and Shovel); Shovels; Tree Chopper with Boom; Trench Machines (Cable Plow); Tunnel Boring Machine; Vacuum Truck

CLASS B: "A" Frame; Backhoe (Combination); Boom Attachment on Loaders (Rate based on size of Bucket) not applicable to Pipehook; Boring and Drilling Machines; Brush Chopper, Shredder and Tree Shredder, Tree Shearer; Bulldozer(Fine Grade); Cableways; Carryalls; Concrete Pump; Concrete Pumping System, Pump Concrete and Similar Types; Conveyors (125 ft. and over); Drill Doctor (duties incl. Dust Collector Maintenance); Front End Loaders (2 yds. but less than 5 yds.); Graders (Finish); Groove Cutting Machine (Ride on Type); Heater Planer; Hoists (all type Hoists, shall also include Steam, Gas, Diesel, Electric, Air Hydraulic, Single and Double Drum, Concrete, Brick Shaft Caisson, Snorkel Roof, and/or any other Similar Type Hoisting Machines, portable or stationary, except Chicago Boom Type); Long Boom Rate to be applied if Hoist is "Outside Material Tower Hoist"**; Hydraulic Cranes-10 tons and under; Hydraulic Dredge; Hydro-Axe; Hydro Blaster; Jacks-Screw Air Hydraulic Power Operated Unit or Console Type (not hand Jack or Pile Load Test Type); Log Skidder; Pans; Pavers (all) concrete; Plate and Frame Filter Press; Pumpcrete Machines, Squeezecrete & Concrete Pumping (regardless of size); Scrapers; Side Booms; "Straddle"Carrier-Ross and similar types; Winch Trucks (Hoisting); Whip Hammer

CLASS C: Asphalt Curbing Machine; Asphalt Plant Engineer; Asphalt Spreader; Autograde Tube Finisher and Texturing Machine (CMI & Similar types); Autograde Curecrete Machine (CMI & Similar Types); Autograde Curb Trimmer & Sidewalk, Shoulder, Slipform (CMI & Similar Types); Bar Bending Machines (Power); Barrier Moving Machine-Zipper; Batchers, Batching Plant and Crusher on Site; Belt Conveyor Systems; Boom Type Skimmer Machines; Bridge Deck Finisher; Bulldozer(except fine grade); Car Dumpers (Railroad); Compressor and Blower Type Units (used independently or mounted on dual purpose Trucks, on Job Site or in conjunction with jobsite, in Loading and Unloading of Concrete, Cement, Fly Ash, Instantcrete, or Similar Type Materials); Compressors (2 or 3 in Battery); Concrete Finishing Machines; Concrete cleaning decontamination machine operator; Concrete Saws and Cutters (Ride-on type); Concrete Spreaders (Hetzel, Rexomatic and Similar Types); Concrete Vibrators; Conveyors (under 125 feet); Crushing Machines; Directional Boring Machines; Ditching Machine-small (Ditch-witch, Vermeer, or Similar type); Dope Pots (Mechanical with or without pump); Dumpsters; Elevator; Fireman; Fork Lifts (Economobile, Lull and Similar Types of Equipment); Front End Loaders (1 yd. and over but under 2 yds.); Generators (2 or 3 in Battery); Giraffe Grinders; Grout Pump; Gunnite Machines (excluding nozzle); Hammer Vibrator (in conjunction with Generator); Heavy Equipment Robotics Operator Technician; Hoists-Roof, Tugger, Aerial Platform Hoist & House Cars; Hoppers; Hopper Doors (power operated); Hydro Blaster; Hydraulic Jacking Trailer; Ladders (motorized); Laddervator; Locomotive-dinky type; Maintenance -Utility Man; Master Environmental Maintenance Technician; Mechanics; Mixers (Excepting Paving Mixers); Motor Patrols; Pavement Breakers (small self - propelled ride on type-also maintains compressor hydraulic unit); Pavement Breaker-truck mounted; Pipe Bending Machine (Power); Pitch Pump; Plaster Pump (regardless of size); Post Hole Digger (Post Pounder & Auger); Pot Hole Killer Trucks or equivalent; Rod Bending Machines (Power); Roller-Black Top; Scales (Power); Seaman pulverizing mixer; Shoulder widener; Silos; Skidsteer (all attachments); Skimmer Machines (boom-type); Steel Cutting Machine (service & maintain); Tam Rock Drill; Tractors; Transfer Machine; Captain (Power Boats); Tug Master (powerboats); Ultra High Pressure Waterjet Cutting Tool System operator/maintenance technician; Vacuum Blasting Machine; Vibrating Plants (used in conjunction with unloading); Welder and Repair Mechanics

CLASS D: Brooms and Sweepers; Chippers; Compressor (single); Concrete Spreaders (small type); Conveyor Loaders (not including Elevator Graders); Engines-large diesel (1620 HP) and Staging Pump; Farm Tractors; Fertilizing Equipment (Operation & Maintenance of); Fine Grade Machine (small type); Form Line Graders (small type); Front End Loader (under 1 yard); Generator (single); Grease, Gas, Fuel and Oil supply trucks; Heaters (Nelson or other type incl. Propane, Natural Gas or Flowtype Units); Lights, Portable Generating Light Plants; Mixers (Concrete, small); Mulching Equipment (Operation and Maintenance of); Pumps (2 or less than 4 inch suction); Pumps (4 inch suction and over incl. submersible pumps); Pumps (Diesel Engine and Hydraulic-immaterial of power); Road Finishing Machines (small type); Rollers-grade, fill or stone base; Seeding Equip. (Operation and Maintenance of); Sprinkler & Water Pump Trucks (used on jobsite or in conjunction with jobsite); Steam Jennies and Boilers-irrespective of use; Stone Spreader; Tamping Machines, Vibrating Ride-on; Temporary Heating Plant (Nelson or other type, incl. Propane, Natural Gas or Flow Type Units); Water & Sprinkler Trucks (used on or in conjunction with jobsite); Welding Machines (Gas, Diesel, and/or Electric Converters of any type, single, two, or three in a battery); Wellpoint Systems (including installation by Bull Gang and Maintenance of)

CLASS E: Assistant Engineer/Oiler; Drillers Helper; Maintenance Apprentice (Deck Hand); Maintenance Apprentice (Oiler); Mechanics' Helper; Tire Repair and Maintenance; Transit/Instrument Man

WAGES:(per hour)

	07/01/2023	07/01/2024 Additional	07/01/2025 Additional
Class A5	$ 65.72 plus 4.00*	$ 2.75***	$ 2.50***
Class A4	64.72 plus 4.00*	2.75***	2.50***
Class A3	63.72 plus 4.00*	2.75***	2.50***
Class A2	61.22 plus 4.00*	2.75***	2.50***
Class A1	60.22 plus 4.00*	2.75***	2.50***
Class A	59.22 plus 4.00*	2.75***	2.50***
Class B	57.63 plus 4.00*	2.75***	2.50***
Class C	55.72 plus 4.00*	2.75***	2.50***
Class D	54.09 plus 4.00*	2.75***	2.50***
Class E	50.38 plus 4.00*	2.75***	2.50***
Safety Engineer	59.96 plus 4.00*	2.75***	2.50***
Helicopter:			
Pilot/Engineer	61.04 plus 4.00*	2.75***	2.50***
Co Pilot	59.22 plus 4.00*	2.75***	2.50***
Communications Engineer	59.22 plus 4.00*	2.75***	2.50***
Surveying:			
Chief of Party	59.22 plus 4.00*	2.75***	2.50***
Transit/Instrument Man	50.38 plus 4.00*	2.75***	2.50***
Rod/Chainman	49.80 plus 4.00*	2.75***	2.50***

Additional $0.75 for Survey work Tunnel under compressed air.
Additional $0.50 for Hydrographic work.

*The $4.00 is added to the Class Base Wage for all hours worked. Additionally, the $4.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

**Outside Material Hoist (Class B) receives additional $ 1.00 per hour on 110 feet up to 199 feet total height, $ 2.00 per hour on 200 feet and over total height.

***To be allocated at a later date

- SHIFT WORK: On all Government mandated irregular or off shift work, an additional 15% on straight time hours.

- On HAZARDOUS WASTE REMOVAL or ASBESTOS REMOVAL work, or any state or federally DESIGNATED HAZARDOUS WASTE SITE:

For projects bid on or before April 1, 2020...Where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection, the Operating Engineer shall receive the hourly wage plus an additional twenty percent (20%) of that wage for the entire shift.

For projects bid after April 1, 2020...On hazardous waste removal work of any kind, including state or federally designated site where the operating engineer is required to wear level A, B, or C personal protection the operating engineer shall receive an hourly wage rate of his regular hourly wage plus $5.00 per hour. An operating engineer working at a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection, shall receive an hourly wage rate of his regular rate plus $ 1.00 per hour. This shall also apply to sites where the level D personal protection is required.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman $ 33.50

SHIFT WORK: On all Government mandated irregular or off shift work, an additional 15% on straight time hours.

OVERTIME PAY
See (B, E, Q, *V, X) on OVERTIME PAGE
*15% premium is also required on shift work benefits

HOLIDAY
Paid: See (5, 6, 10, 13, 15) on HOLIDAY PAGE
Overtime: See (5, 6, 10, 13, 15) on HOLIDAY PAGE
Holidays falling on Sunday will be celebrated on Monday.

REGISTERED APPRENTICES
(1) year terms at the following percentage of journeyman's wage:

1st year	60% of Class base wage plus $4.00*
2nd year	70% of Class base wage plus $4.00*
3rd year	80% of Class base wage plus $4.00*
4th year	90% of Class base wage plus $4.00*

*The $4.00 is added to the Class Base Wage for all hours worked. Additionally, the $4.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

Supplemental Benefits per hour:

Apprentices $ 33.50

11-825

Operating Engineer - Marine Dredging — 12/01/2023

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:	07/01/2023	10/01/2023
CLASS A1 Deck Captain, Leverman Mechanical Dredge Operator Licensed Tug Operator 1000HP or more.	$ 43.94	$ 45.26
CLASS A2 Crane Operator (360 swing)	39.16	40.33
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	38.00	39.14
CLASS B2 Certified Welder	35.77	36.84
CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	34.79	35.83

CLASS C2 Boat Operator	33.67	34.68
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor	27.97	28.81

SUPPLEMENTAL BENEFITS
Per Hour:
THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes A & B	$ 11.85 plus 6% of straight time wage, Overtime hours add $ 0.63	$ 12.00 plus 6% of straight time wage, Overtime hours add $ 0.63
All Class C	$ 11.60 plus 6% of straight time wage, Overtime hours add $ 0.50	$ 11.75 plus 6% of straight time wage, Overtime hours add $ 0.50
All Class D	$ 11.35 plus 6% of straight time wage, Overtime hours add $ 0.38	$ 11.60 plus 6% of straight time wage, Overtime hours add $ 0.50

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 - Steel Erectors — 12/01/2023

JOB DESCRIPTION Operating Engineer - Steel Erectors **DISTRICT** 11

ENTIRE COUNTIES
Delaware, Orange, Rockland, Sullivan, Ulster

WAGES
CLASS A3: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with a 140 ft. boom and over.

CLASS A2: Cranes, Derricks and Pile Drivers 100 tons or more and Tower Cranes, with up to a 139 ft. boom and under.

CLASS A1: Cranes, Derricks and Pile Drivers less than 100 tons with a 140 ft. boom and over.

CLASS A: Cranes, Derricks and Pile Drivers less than 100 tons with up to a 139 ft. boom and under.

CLASS B: "A" Frame; Cherry Pickers(10 tons and under); Hoists (all type Hoists, shall also include Steam, Gas, Diesel, Electric, Air Hydraulic, Single and Double Drum, Concrete, Brick Shaft Caisson, Snorkel Roof, and/or any other Similar Type Hoisting Machines, portable or stationary, except Chicago Boom Type); Jacks-Screw Air Hydraulic Power Operated Unit or Console Type (not hand Jack or Pile Load Test Type); Side Booms; Straddle Carrier

CLASS C: Aerial Platform used as Hoist; Compressors (2 or 3 in Battery); Concrete cleaning/ decontamination machine operator; Directional Boring Machines; Elevator or House Cars; Conveyers and Tugger Hoists; Fireman; Fork Lifts; Generators (2 or 3 in Battery); Heavy Equipment Robotics Operator/Technician; Master Environmental Maintenance Technician; Maintenance -Utility Man; Rod Bending Machines (Power); Captain(powerboat); Tug Master; Ultra High Pressure Waterjet Cutting Tool System; Vacuum Blasting Machine; Welding Machines(gas or electric,2 or 3 in battery, including diesels); Transfer Machine; Apprentice Engineer/Oiler with either one compressor or one welding machine when used for decontamination and remediation

CLASS D: Compressor (single); Welding Machines (Gas, Diesel, and/or Electric Converters of any type); Welding System Multiple (Rectifier Transformer type)

CLASS E: Assistant Engineer/Oiler; Maintenance Apprentice (Deck Hand);Drillers Helper; Maintenance Apprentice (Oiler); Mechanics' Helper; Transit/Instrument Man

WAGES:(per hour)

	07/01/2023	07/01/2024 Additional	07/01/2025 Additional
Class A3	$ 67.74 plus 4.00*	$ 2.75**	$ 2.50**
Class A2	66.08 plus 4.00*	2.75**	2.50**
Class A1	63.24 plus 4.00*	2.75**	2.50**
Class A	61.58 plus 4.00*	2.75**	2.50**
Class B	58.79 plus 4.00*	2.75**	2.50**
Class C	56.13 plus 4.00*	2.75**	2.50**
Class D	54.60 plus 4.00*	2.75**	2.50**
Class E	50.84 plus 4.00*	2.75**	2.50**
Vacuum Truck	59.55 plus 4.00*	2.75**	2.50**
Safety Engineer	60.41 plus 4.00*	2.75**	2.50**
Helicopter:			
Pilot/Engineer	63.24 plus 4.00*	2.75**	2.50**
Co Pilot	62.85 plus 4.00*	2.75**	2.50**
Communications Engineer	62.85 plus 4.00*	2.75**	2.50**
Surveying:			
Chief of Party	59.55 plus 4.00*	2.75**	2.50**
Transit/Instrument man	50.84 plus 4.00*	2.75**	2.50**
Rod/Chainman	49.80 plus 4.00*	2.75**	2.50**

Additional $0.75 for Survey work Tunnels under compressed air.
Additional $0.50 for Hydrographic work.

*The $4.00 is added to the Class Base Wage for all hours worked. Additionally, the $4.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

**To be allocated at a later date

- SHIFT WORK: On all Government mandated irregular or off shift work, an additional 15% on straight time hours.
- On HAZARDOUS WASTE REMOVAL or ASBESTOS REMOVAL work, or any state or federally DESIGNATED HAZARDOUS WASTE SITE:

For projects bid on or before April 1, 2020...Where the Operating Engineer is in direct contact with hazardous material and when personal protective equipment is required for respiratory, skin and eye protection, the Operating Engineer shall receive the hourly wage plus an additional twenty percent (20%) of that wage for the entire shift.

For projects bid after April 1, 2020...On hazardous waste removal work of any kind, including state or federally designated site where the operating engineer is required to wear level A, B, or C personal protection the operating engineer shall receive an hourly wage rate of his regular hourly wage plus $5.00 per hour. An operating engineer working at a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection, shall receive an hourly wage rate of his regular rate plus $ 1.00 per hour. This shall also apply to sites where the level D personal protection is required.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 33.50

OVERTIME PAY
See (B, E, Q, *V, X) on OVERTIME PAGE
*15% premium is also required on shift work benefits

HOLIDAY
Paid: See (5, 6, 10, 13, 15) on HOLIDAY PAGE
Overtime: See (5, 6, 10, 13, 15) on HOLIDAY PAGE
Holidays falling on Sunday will be celebrated on Monday.

REGISTERED APPRENTICES
(1) year terms at the following percentage of journeyman's wage.

1st year	60% of Class base wage plus $4.00*
2nd year	70% of Class base wage plus $4.00*
3rd year	80% of Class base wage plus $4.00*

4th year	90% of Class base wage plus $4.00*

*The $4.00 is added to the Class Base Wage for all hours worked. Additionally, the $4.00 is subject to the V-Code listed on the OVERTIME CODE Sheet.

Supplemental Benefits per hour:

Apprentices	$ 33.50

11-825SE

Painter 12/01/2023

JOB DESCRIPTION Painter **DISTRICT** 1

ENTIRE COUNTIES
Rockland

WAGES
Wages per hour

	07/01/2023	07/01/2024 Additional
Brush/Paper Hanger	$ 41.17	+ $1.93*
Dry Wall finisher	41.17	+ $1.93*
Sandblaster-Painter	41.17	+ $1.93*
Lead Abatement	41.17	+ $1.93*
Spray Rate	42.17	+ $1.93*

(*) To be allocated at later date.

See Bridge Painters rates for the following work:
Structural Steel, all work performed on tanks, ALL BRIDGES, towers, smoke stacks, flag poles. Rate shall apply to all of said areas from the ground up.

SUPPLEMENTAL BENEFITS
Per hour

Journeyperson	$ 26.28

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour

Six (6) month terms at the following percentage of Journeyperson's wage

1st	2nd	3rd	4th	5th	6th
50%	55%	65%	75%	85%	95%

Supplemental Benefits per hour worked

1st term	$ 11.14
All others	26.28

1-155ROC

Painter - Bridge & Structural Steel 12/01/2023

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:

	07/01/2023	10/01/2023
Bridge Painting:	$ 54.50	$ 56.00

+ 10.10*	+ 10.35*

ADDITIONAL $6.50 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:

$ 11.78	$ 12.43
+ 30.85*	+ 31.55*

* 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	$ 21.80	$ 22.40
	+ 4.04	+ 4.14
2nd year	$ 32.70	$ 33.60
	+ 6.06	+ 6.21
3rd year	$ 43.60	$ 44.80
	+ 8.08	+ 8.28

Supplemental Benefits - Per hour:

1st year	$ .90	$ 1.16
	+ 12.34	+ 12.62
2nd year	$ 7.07	$ 7.46
	+ 18.51	+ 18.93
3rd year	$ 9.42	$ 9.94
	+ 24.68	+ 25.24

NOTE: All premium wages are to be calculated on base rate per hour only.

8-DC-9/806/155-BrSS

Painter - Line Striping — 12/01/2023

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):	07/01/2023	01/01/2024	07/01/2024
Striping-Machine Operator*	$ 31.53	$ 31.53	$ 34.12
Linerman Thermoplastic	38.34	38.34	41.12

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.

NOTE - The "Employer Registration" (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30,2023 will expire within the granted time frame.

For Pre-Registered Projects 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. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS
Per hour paid:
Journeyworker:

Striping Machine Operator:	$ 10.03	$ 22.24	$ 23.65
Linerman Thermoplastic:	10.03	22.24	23.65

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	$ 15.00	$ 15.00
2nd Term:	18.92	18.92	20.47
3rd Term:	25.22	25.22	27.30

Supplemental Benefits per hour:

1st term:	$ 9.16	$ 22.24	$ 23.65
2nd Term:	10.03	22.24	23.65
3rd Term:	10.03	22.24	23.65

8-1456-LS

Painter - Metal Polisher — 12/01/2023

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

	07/01/2023
Metal Polisher	$ 38.18
Metal Polisher*	39.28
Metal Polisher**	42.18

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2023
Journeyworker:	
All classification	$ 12.34

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:

	07/01/2023
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	$ 8.69
2nd year	8.69
3rd year	8.69

8-8A/28A-MP

Plumber — 12/01/2023

JOB DESCRIPTION Plumber **DISTRICT** 11

ENTIRE COUNTIES
Orange, Rockland, Sullivan

PARTIAL COUNTIES
Ulster: Only the Townships of Plattekill, Marlboro, Wawarsing, and Shawangunk (except for Wallkill and Shawangunk Prisons).

WAGES
REFRIGERATION: For commercial and industrial refrigeration which means service, maintenance, and installation work where the combined compressor tonnage does not exceed 40 tons.
AIR CONDITIONING: Air conditioning to be installed that is water cooled shall not exceed 25 tons. This will include the piping of the component system and erection of water tower. Air conditioning that is air cooled shall not exceed 50 tons.

WAGES: (per hour)

	07/01/2023	05/01/2024 Additional	05/01/2025 Additional
Plumber	$ 38.59	$ 2.25*	$ 2.50*

*To be allocated at a later date

Star Certification: an additional $ 1.00 per hour over scale will be paid to all those who have Star Certification.

Shift Differential: When mandated by the governmental agency, an additional 15% premium will be paid for irregular work day or for 2nd and 3rd shift.

SUPPLEMENTAL BENEFITS
Per hour:
Journeyman
$ 36.07*

*For overtime or shift differential work, $0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

OVERTIME PAY

See (B, G, P, *V) on OVERTIME PAGE
* A portion of the benefit amount is subject to the V code for overtime and shift differential work.

HOLIDAY
Paid: See (5, 6, 13, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 13, 15, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1)year terms at the following wage.

	07/01/2023
1st term	$ 17.37
2nd term	21.23
3rd term	25.09
4th term	28.95
5th term	32.81

Supplemental Benefits per hour:
Apprentices

1st term	$ 16.31*
2nd term	19.90*
3rd term	23.50*
4th term	27.10*
5th term	30.69*

*For overtime or shift differential work, $0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

11-373 Refrig

Plumber — 12/01/2023

JOB DESCRIPTION Plumber **DISTRICT** 11

ENTIRE COUNTIES
Orange, Rockland, Sullivan

PARTIAL COUNTIES
Ulster: Only the Townships of Plattekill, Marlboro, Wawarsing, and Shawangunk (except for Wallkill and Shawangunk Prisons).

WAGES

WAGES:(per hour)	07/01/2023	05/01/2024 Additional
Plumber/Steamfitter	$ 49.95	$ 2.25*

*to be allocated at a later date

Note: For all work 40-60 feet above ground add $ 0.25 per hour, over 60 feet add $ 0.50 per hour.

Shift Differential: When mandated by the governmental agency, an additional 15% premium will be paid for irregular work day or for 2nd and 3rd shift.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 44.57

*For overtime or shift differential work, $0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

OVERTIME PAY
See (B, E, Q, *V) on OVERTIME PAGE
* A portion of the benefit amount is subject to the V code for overtime and shift differential work.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16) on HOLIDAY PAGE
When a holiday falls on a Saturday, the day prior shall be considered and recognized as the holiday. When a holiday falls on a Sunday, the day proceeding shall be considered and recognized as the holiday to be observed.

REGISTERED APPRENTICES
(1) year terms at the following wages.

	07/01/2023
1st term	$ 17.49
2nd term	22.48
3rd term	27.48
4th term	32.47

5th term	39.96

Supplemental Benefits per hour:

1st term	$ 15.69*
2nd term	20.14*
3rd term	24.57*
4th term	29.03*
5th term	35.67*

*For overtime or shift differential work, $0.10 is paid at straight time, the remaining balance is paid at the same premium as the wages.

11-373 SF

Roofer — 12/01/2023

JOB DESCRIPTION Roofer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, New York, Orange, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2023	05/01/2024 Additional
Roofer/Waterproofer	$ 46.50 + $7.00*	$2.50

* 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: $ 31.37

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 apprentices indentured prior to 01/01/2023

1st	2nd	3rd	4th
$ 16.28	$ 23.25 + 3.50*	$ 27.90 + 4.20*	$ 34.88 + 5.26*

Supplements:

1st	2nd	3rd	4th
$ 4.03	$ 15.85	$ 18.95	$ 23.61

* This portion is not subjected to overtime premiums.

(1) year term apprentices indentured after 01/01/2023

1st	2nd	3rd	4th	5th
$ 17.67	$ 20.93 + 3.16*	$ 23.25 + 3.50*	$ 27.90 + 4.20*	$ 34.88 + 5.26

Supplements:

1st	2nd	3rd	4th	5th
$ 7.61	$ 14.29	$ 15.85	$ 18.95	$ 23.61

* This portion is not subjected to overtime premiums.

9-8R

Sheetmetal Worker — 12/01/2023

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

	07/01/2023
SheetMetal Worker	$ 47.00 + 3.60*

*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 $ 45.62

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
$ 17.50 + 1.44*	$ 19.67 + 1.62*	$ 21.87 + 1.80*	$ 24.05 + 1.98*	$ 26.24 + 2.16*	$ 28.44 + 2.34*	$ 31.10 + 2.52*	$ 33.75 + 2.70*

*This portion is not subject to overtime premiums.

Supplemental Benefits per hour:

Apprentices	
1st term	$ 19.53
2nd term	21.99
3rd term	24.42
4th term	26.88
5th term	29.32
6th term	31.75
7th term	33.72
8th term	35.71

Sheetmetal Worker — 12/01/2023

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour: 07/01/2023

Sign Erector $ 56.00

NOTE: Structurally Supported Overhead Highway Signs(See STRUCTURAL IRON WORKER CLASS)

SUPPLEMENTAL BENEFITS
Per Hour: 07/01/2023

Sign Erector $ 55.66

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:

07/01/2023

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th

$ 14.95	$ 16.95	$ 18.93	$ 20.93	$ 28.56	$ 31.05	$ 33.57	$ 36.05	$ 38.56	$ 41.05

4-137-SE

Sprinkler Fitter — 12/01/2023

JOB DESCRIPTION Sprinkler Fitter **DISTRICT** 1

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES
Per hour 07/01/2023

Sprinkler Fitter $ 50.86

SUPPLEMENTAL BENEFITS
Per hour

Journeyperson $ 30.19

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
$ 24.77	$ 27.53	$ 30.03	$ 32.78	$ 35.53	$ 38.29	$ 41.04	$ 43.79	$ 46.54	$ 49.30

Supplemental Benefits per hour

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 8.74	$ 8.74	$ 20.32	$ 20.32	$ 20.57	$ 20.57	$ 20.57	$ 20.57	$ 20.57	$ 20.57

1-669.2

Teamster - Building / Heavy&Highway — 12/01/2023

JOB DESCRIPTION Teamster - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Dutchess, Orange, Rockland, Sullivan, Ulster

WAGES
GROUP 1: LeTourneau Tractors, Double Barrel Euclids, Athney Wagons and similar equipment (except when hooked to scrapers), I-Beam and Pole Trailers, Tire Trucks, Tractor and Trailers with 5 axles and over, Articulated Back Dumps and Road Oil Distributors, Articulated Water Trucks and Fuel Trucks/Trailers, positions requiring a HAZMAT CDL endorsement.

GROUP 1A: Drivers on detachable Gooseneck Low Bed Trailers rated over 35 tons.

GROUP 2: All equipment 25 yards and up to and including 30 yard bodies and cable Dump Trailers and Powder and Dynamite Trucks.

GROUP 3: All Equipment up to and including 24-yard bodies, Mixer Trucks, Dump Crete Trucks and similar types of equipment, Fuel Trucks, Batch Trucks and all other Tractor Trailers, Hi-Rail Truck.

GROUP 4: Tri-Axles, Ten Wheelers, Grease Trucks, Tillerman, Pattern Trucks, Attenuator Trucks, Water Trucks, Bus.

GROUP 5: Straight Trucks.

GROUP 6: Pick-up Trucks for hauling materials and parts, and Escort Man over-the-road.

WAGES: (per hour) 07/01/2023

GROUP 1	$ 34.58
GROUP 1A	35.72
GROUP 2	34.02
GROUP 3	33.80
GROUP 4	33.69
GROUP 5	33.57
GROUP 6	33.57

NOTE ADDITIONAL PREMIUMS:
- On projects requiring an irregular shift a premium of 10% will be paid on wages. The premium will be paid for off-shift or irregular shift work when mandated by Governmental Agency.
- Employees engaged in hazardous/toxic waste removal, on a State or Federally designated hazardous/toxic waste site, where the employee comes in contact with hazardous/toxic waste material and when personal protective equipment is required for respiratory, skin, or eye protection, the employee shall receive an additional 20% premium above the hourly wage.

NOTE - The 'Employer Registration' (30.1) use of a '4 Day/10 Hour Work schedules' will no longer be accepted or processed. All registered projects prior to June 30,2023 will expire within the granted time frame.

For Pre-Registered Projects 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. For further clarification contact your local Bureau Office.

SUPPLEMENTAL BENEFITS

Per hour:

First 40 hours	$ 44.59
Over 40 hours	36.99

OVERTIME PAY

See (*B, E, **E2, ***P, X) on OVERTIME PAGE
*Holidays worked Monday through Friday receive Double Time (2x) after 8 hours.
**Makeup day limited to the employees who were working on the site that week.
***Sunday Holidays are paid at a rate of double time and one half (2.5x) for all hours worked.

HOLIDAY

Paid: See (5, 6, 15, 25) on HOLIDAY PAGE
Overtime: See (*1) on HOLIDAY PAGE
- Any employee working two (2) days in any calendar week during which a holiday occurs shall receive a days pay for each holiday occurring during said week. This provision shall also apply if a holiday falls on a Saturday or Sunday.
*See OVERTIME PAY section for when additional premium is applicable on Holiday hours worked.

11-445B/HH

Teamster - Delivery - Building / Heavy&Highway — 12/01/2023

JOB DESCRIPTION Teamster - Delivery - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES

Dutchess, Orange, Rockland, Sullivan, Ulster

WAGES

Group 1 Tractor Trailer Drivers
Group 2 Tri- Axle

Wages:	07/01/2023
Group 1	$ 33.70
Group 2	29.70

Hazardous/Toxic Waste Removal additional 20% when personal protective equipment is required.

SUPPLEMENTAL BENEFITS

Per hour paid:

First 40 hours	$ 32.30
Over 40 hours	0.00

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE

HOLIDAY

Paid: See (5, 13, 15, 16, 20, 22, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 13, 15, 16, 20, 22, 25, 26) on HOLIDAY PAGE
- Employee must work either the scheduled day of work before or the scheduled day of work after the holiday in the workweek.
- Any employee working one (1) day in the calendar week during which a holiday occurs shall receive a day's pay for each holiday occurring during said week. This provision shall also apply if a holiday falls on a Saturday.

- When any of the recognized holidays occur on Sunday and are celebrated any day before or after the holiday Sunday, such days shall be considered as the holiday and paid for as such.

11-445 B/HH Delivery

Welder 12/01/2023

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 07/01/2023

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 12226

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: (Check Only One) ☐ Contracting Agency ☐ Architect or Engineering Firm ☐ Public Work District Office Date:

A. Public Work Contract to be let by: (Enter Data Pertaining to Contracting/Public Agency)

1. Name and complete address ☐ (Check if new or change)

Telephone Fax

E-Mail:

2. NY State Units (see Item 5).

- ☐ 01 DOT
- ☐ 02 OGS
- ☐ 03 Dormitory Authority
- ☐ 04 State University Construction Fund
- ☐ 05 Mental Hygiene Facilities Corp.
- ☐ 06 OTHER N.Y. STATE UNIT
- ☐ 07 City
- ☐ 08 Local School District
- ☐ 09 Special Local District, i.e., Fire, Sewer, Water District
- ☐ 1O Village
- ☐ 11 Town
- ☐ 12 County
- ☐ 13 Other Non-N.Y. State (Describe)

3. SEND REPLY TO ☐ (check if new or change)
Name and complete address:

Telephone Fax

E-Mail:

4. SERVICE REQUIRED. Check appropriate box and provide project information.

☐ New Schedule of Wages and Supplements.

APPROXIMATE BID DATE :

☐ Additional Occupation and/or Redetermination

PRC NUMBER ISSUED PREVIOUSLY FOR THIS PROJECT :

OFFICE USE ONLY

B. PROJECT PARTICULARS

5. Project Title _____

Description of Work _____

_____

Contract Identification Number _____

Note: For NYS units, the OSC Contract No. _____

6. Location of Project:
Location on Site _____

Route No/Street Address _____

Village or City _____

Town _____

County _____

7. Nature of Project - Check One:

- ☐ 1. New Building
- ☐ 2. Addition to Existing Structure
- ☐ 3. Heavy and Highway Construction (New and Repair)
- ☐ 4. New Sewer or Waterline
- ☐ 5. Other New Construction (Explain)
- ☐ 6. Other Reconstruction, Maintenance, Repair or Alteration
- ☐ 7. Demolition
- ☐ 8. Building Service Contract

8. OCCUPATION FOR PROJECT :

- ☐ Construction (Building, Heavy Highway/Sewer/Water)
- ☐ Tunnel
- ☐ Residential
- ☐ Landscape Maintenance
- ☐ Elevator maintenance
- ☐ Exterminators, Fumigators
- ☐ Fire Safety Director, NYC Only
- ☐ Fuel Delivery
- ☐ Guards, Watchmen
- ☐ Janitors, Porters, Cleaners, Elevator Operators
- ☐ Moving furniture and equipment
- ☐ Trash and refuse removal
- ☐ Window cleaners
- ☐ Other (Describe)

9. Does this project comply with the Wicks Law involving separate bidding? YES ☐ NO ☐

10. Name and Title of Requester

Signature

SEE PAGE TWO FOR LAWS RELATING TO PUBLIC WORK CONTRACTS

[redacted]

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://apps.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 11/22/2023

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		ALL COUNTY SEWER & DRAIN, INC.		7 GREENFIELD DR WARWICK NY 10990	03/25/2022	03/25/2027
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		ANGELO TONDO		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL		ANITA SALERNO		158 SOLAR ST SYRACUSE NY 13204	01/07/2019	01/07/2024
DOL	DOL	*****4231	ANKER'S ELECTRIC SERVICE, INC.		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
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		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	*****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	*****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
DOL	DOL	*****5161	CALADRI DEVELOPMENT CORP.		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
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	*****4155	CASA BUILDERS, INC.	FRIEDLANDER CONSTRUCTION	64 N PUTT CONNERS ROAD NEW PALTZ NY 12561	05/10/2023	05/10/2028

NYSDOL Bureau of Public Work Debarment List 11/22/2023

Article 8

DOL	AG	*****7247	CENTURY CONCRETE CORP		2375 RAYNOR ST RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****0026	CHANTICLEER CONSTRUCTION LLC		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	NYC	*****2117	CHARAN ELECTRICAL ENTERPRISES		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
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 PAPASTEFANOU A/K/A CHRIS PAPASTEFANOU		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL		CRAIG JOHANSEN		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
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 DOUGLASTON NY 11363	01/14/2019	01/14/2024
DOL	DOL	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DANIEL ROBERT MCNALLY		7 GREENFIELD DRIVE WARWICK NY 10990	03/25/2022	03/25/2027
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	DOL		DAVID FRIEDLANDER		64 NORTH PUTT CORNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	NYC		DAVID WEINER		14 NEW DROP LANE 2ND FLOORSTATEN ISLAND NY 10306	11/14/2019	11/14/2024
DOL	DOL		DELPHI PAINTING & DECORATING CO INC		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL		DINA TAYLOR		64 N PUTT CONNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL	*****5175	EAGLE MECHANICAL AND GENERAL CONSTRUCTION LLC		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025
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	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	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	DA		GIOVANNA TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA	*****0213	GORILLA CONTRACTING GROUP, LLC		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DOL		HANS RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
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.M.J CONSTRUCTION		151 OSTRANDER AVENUE SYRACUSE NY 13205	11/21/2022	11/21/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	12/12/2022	12/12/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JAMES J. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
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	11/15/2022	11/15/2027
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
DOL	DOL	*****2435	JEFFEL D. JOHNSON	JMJ7 AND SON	5553 CAIRNSTRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JEFFEL JOHNSON ELITE CARPENTER REMODEL AND CONSTRUCTION		C2 EVERGREEN CIRCLE LIVERPOOL NY 13090	11/21/2022	11/21/2027
DOL	DOL	*****2435	JEFFREY M. JOHNSON	JMJ7 AND SON	5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
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	DOL		JMJ7 & SON CONSTRUCTION, LLC		5553 CAIRNS TRAIL LIVERPOOL NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 AND SONS CONTRACTORS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS		7014 13TH AVENUE BROOKLYN NY 11228	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS AND SONS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS, LLC		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JOHN GOCEK		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
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	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		JOSEPH K. SALERNO		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL		JOSEPH K. SALERNO II		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
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	11/15/2022	11/15/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026

NYSDOL Bureau of Public Work Debarment List 11/22/2023

Article 8

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	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
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	*****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		KMA GROUP II, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL	*****1833	KMA GROUP INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KMA INSULATION, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	NYC		KULWANT S. DEOL		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DA	*****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	AG	*****3291	LINTECH ELECTRIC, INC.		3006 TILDEN AVE BROOKLYN NY 11226	02/16/2022	02/16/2027
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		MATTHEW P. KILGORE		4156 WILSON ROAD EAST TABERG NY 13471	03/26/2019	03/26/2024
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	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
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

NYSDOL Bureau of Public Work Debarment List 11/22/2023

Article 8

DOL	DOL	*****7790	NATIONAL BUILDING & RESTORATION CORP		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****1797	NATIONAL CONSTRUCTION SERVICES, INC		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DA	*****9786	NATIONAL INSULATION & GC CORP		180 MILLER PLACE HICKSVILLE NY 11801	12/12/2018	12/12/2023
DOL	NYC		NAVIT SINGH		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DA		NICHOLAS T. ANALITIS		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
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	11/15/2022	11/15/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
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	NYC	*****5643	NYC LINE CONTRACTORS, INC.		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
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		PETER STEVENS		8269 21ST ST BELLEROSE NY 11426	12/22/2022	12/22/2027
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	07/11/2022	07/11/2027
DOL	DA	*****7559	REGAL CONTRACTING INC.		24 WOODBINE AVE NORTHPORT NY 11768	10/01/2020	10/01/2025
DOL	DOL		RICHARD REGGIO		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
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		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	*****7172	RZ & AL INC.		198 RIDGE AVENUE VALLEY STREAM NY 11581	06/06/2022	06/06/2027
DOL	DOL	*****1365	S & L PAINTING, INC.		11 MOUNTAIN ROAD P.O BOX 408MONROE NY 10950	03/20/2019	03/20/2024
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 13218	07/16/2021	07/16/2026
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	DA	*****0476	SAMCO ELECTRIC CORP.		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	NYC	*****1130	SCANA CONSTRUCTION CORP.		863 WASHINGTON STREET FRANKLIN SQUARE NY 11010	03/10/2020	03/10/2025

NYSDOL Bureau of Public Work Debarment List 11/22/2023

Article 8

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		SHULEM LOWINGER		11 MOUNTAIN ROAD 28 VAN BUREN DRMONROE NY 10950	03/20/2019	03/20/2024
DOL	DA		SILVANO TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
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	NYC	*****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	*****3800	SUBURBAN RESTORATION CO. INC.		5-10 BANTA PLACE FAIR LAWN PLACE NJ 07410	03/29/2021	03/29/2026
DOL	DOL	*****1060	SUNN ENTERPRISES GROUP, LLC		370 W. PLEASANTVIEW AVE SUITE 2.329HACKENSACK NJ 07601	02/11/2019	02/11/2024
DOL	DOL	*****9150	SURGE INC.		8269 21ST STREET BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL		SYED RAZA		198 RIDGE AVENUE NY 11581	06/06/2022	06/06/2027
DOL	DOL	*****8209	SYRACUSE SCALES, INC.		158 SOLAR ST SYRACUSE NY 13204	01/07/2019	01/07/2024
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
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	*****1050	TRI STATE CONSTRUCTION OF NY CORP.		50-39 175TH PLACE FRESH MEADOWS NY 11365	03/28/2022	03/28/2027
DOL	DA	*****4106	TRIPLE H CONCRETE CORP		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****8210	UPSTATE CONCRETE & MASONRY CONTRACTING CO INC		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	*****6418	VALHALLA CONSTRUCTION, LLC.		796 PHLEPS 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

NYSDOL Bureau of Public Work Debarment List 11/22/2023

Article 8

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	DOL		VIKTORIA RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
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	*****8266	WILLIAM CHRIS MCCLENDON	MCCLENDON ASPHALT PAVING	1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM CHRIS MCCLENDON		1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
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 CONTRACTING, INC.	54 PENTAQUIT AVE BAYSHORE NY 11706	01/19/2021	01/19/2026
DOL	DOL		XENOFON EFTHIMIADIS		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028

SECTION 990002.01
APPENDIX COVER 'B1'

PEARL RIVER PUBLIC LIBRARY

80 Franklin Avenue
Pearl River, NY 10965

APPENDIX 'B1'
HAZARDOUS MATERIAL SURVEY REPORT 1 - ECMS

END OF SECTION

Environmental Consulting and Management Services
Tel: 845-638-0640
Cell: 914-523-1523
info@ecmsny.com
www.ecmsny.com

April 15, 2022

Alex Stojkovic, AIA, LEED Green Associate
Lothrop Associates LLP
333 Westchester Avenue
White Plains, New York 10604

d: 914.234.8402
c: 914.426.0107
e: astojkovic@lothropassociates.com

Re: AMENDED Limited Asbestos Inspection, Ceiling & Roofing Materials *Services @*
Pearl River Library

Dear Alex:

As per your request and pursuant to our accepted proposal, on March 8, 2022, I visited the library, met with Brett of your office and we proceeded to the targeted office complex. The inspection was performed in response to upcoming renovations and the need to have suspect materials tested prior to renovation. A follow-up site visit and sampling of the PH/Mechanical Room Valves and Elbows was performed on April 5, 2022, at the request of Robert Gabalski.

All collected samples were placed into sampling bags, labeled, recorded on our chain of custody, and submitted for analysis to Metro and EMSL Testing Laboratory.

The specific materials encountered were sampled and tested:

Valve/Elbow Insulation
Wall Sheetrock & Joint Compound
Ceiling 2x2 Lay-In Ceiling Tiles
Floor Tiles, 12x12 & Attached Mastic
Carpet Squares Mastic
Roofing Felt Layer
Roofing

Results:

Following analysis, the following results were reported:

Valve/Elbow Insulation	Negative
Wall Sheetrock & Joint Compound	Negative
Ceiling 2x2 Lay-In Ceiling Tiles	Negative
Floor Tiles, 12x12 & Attached Mastic	Negative
Carpet Squares Mastic	Negative
Roofing Felt Layer	Negative
Roofing	Negative

Discussion:

The sampled materials are Negative for asbestos, Refer to Metro Report, B22030354. Based upon the data and the homogeneity of the sampled materials, it is unlikely that any differing materials will be encountered and as such, the materials are deemed negative with no further testing required.

Credentials:

ECMS inspectors performing the on-site inspection work are accredited within the State of New York for asbestos. Additionally, inspectors are also New York City Department of Environmental Protection Agency Certified Asbestos Inspectors. Environmental Consulting & Management Services, Inc. holds a New York State Department of Labor Contractor's Handling License, this is required to inspect and collect samples within NYS for asbestos. (Copies of licenses previously submitted).

If you have questions or require additional information, please contact me.

Sincerely,

Marc Rutstein

Marc Rutstein
President

METRO ANALYTICAL LABORATORIES
255 West 36th St., Suite #101
New York, NY 10018
p: (212) 695-0165 f: (212) 695-0183

ASBESTOS ANALYSIS of BULK SAMPLE by POLARIZED LIGHT MICROSCOPY and TRANSMISSION ELECTRON MICROSCOPY

Client:	**Environmental Consulting & Management Services Ir**	Contract:	**Pearl River Library**	**Metro Lab ID #:**	**B22030354**
Address:	10 Filmont Rd	Client Job #:			
	New City NY 10956	Location:	**80 Franklin Avenue Renovation**		
	P: (845) 638-0640 F:		**Pearl River** **New York**	Sample Received:	03/10/2022
				PLM Analysis Date:	03/10/2022
Contact:	**Marc Rutstein**	Sampled By:	M.R.	TEM Analysis Date:	03/11/2022
	M:	Sampled Date:	03/08/2022	Amended By:	Turiana Moreira
	E: Marc.Rutstein@ecmsny.com	Turnaround Time:	72 hrs	Amended Date:	03/14/2022

Summary of Analysis

LAB ID #	Client Sample #	Sample Description	Test	Fibrous Material	Non-Fibrous Material	Asbestos	Total Asbestos
1	1A	Grey / Brown Inhomogenous Fibrous 1ST FLOOR - OFFICE AREA - SR / JC	NY ELAP 198.1 NY ELAP 198.6 NY ELAP 198.4	45% Cellulose	55% Gypsum	None Detected	
2	1B	White Homogenous Granular 1ST FLOOR - OFFICE AREA - SR / JC	NY ELAP 198.1 NY ELAP 198.6 NY ELAP 198.4		100% Non-Fibrous	None Detected	
3	2A	Grey / Brown Inhomogenous Fibrous 1ST FLOOR - OFFICE AREA - SR / JC	NY ELAP 198.1 NY ELAP 198.6 NY ELAP 198.4	60% Cellulose	40% Gypsum	None Detected	
4	2B	White Homogenous Granular 1ST FLOOR - OFFICE AREA - SR / JC	NY ELAP 198.1 NY ELAP 198.6 NY ELAP 198.4		100% Non-Fibrous	None Detected	
5	3A	Grey / Brown Inhomogenous Fibrous 1ST FLOOR - OFFICE AREA - SR / JC	NY ELAP 198.1 NY ELAP 198.6 NY ELAP 198.4	65% Cellulose	35% Gypsum	None Detected	
6	3B	White Homogenous Granular 1ST FLOOR - OFFICE AREA - SR / JC	NY ELAP 198.1 NY ELAP 198.6 NY ELAP 198.4		100% Non-Fibrous	None Detected	
7	4	Beige Homogenous NOB 1ST FLOOR - OFFICE AREA - C. TILE - 2 x 2	NY ELAP 198.1 NY ELAP 198.6 NY ELAP 198.4			Inconclusive None Detected	
8	5	Beige Homogenous NOB 1ST FLOOR - OFFICE AREA - C. TILE - 2 x 2	NY ELAP 198.1 NY ELAP 198.6 NY ELAP 198.4			Inconclusive None Detected	
9	6	Beige Homogenous NOB 1ST FLOOR - STAFF ROOM - FL. TILE 12 x 12	NY ELAP 198.1 NY ELAP 198.6 NY ELAP 198.4			Inconclusive None Detected	
10	7	Beige Homogenous NOB 1ST FLOOR - STAFF ROOM - FL. TILE 12 x 12	NY ELAP 198.1 NY ELAP 198.6 NY ELAP 198.4			Inconclusive None Detected	

Comments

Equipment: PLM SCOPE Nikon Optiphot-2
TEM SCOPE #2 - Hitachi H-7000

Zlatan Dimitrijevic
Laboratory Director

Reda Abdelmalak / Jose Perez
PLM Analyst

Hany G Rezkalla
TEM Analyst

NYS ELAP ID # 12003

NVLAP Lab Code 500081-0

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ASBESTOS ANALYSIS of BULK SAMPLE by POLARIZED LIGHT MICROSCOPY and TRANSMISSION ELECTRON MICROSCOPY

Client:	**Environmental Consulting & Management Services Ir**	Contract:	**Pearl River Library**	**Metro Lab ID #:**	**B22030354**
Address:	10 Filmont Rd	Client Job #:			
	New City NY 10956	Location:	**80 Franklin Avenue Renovation**		
	P: (845) 638-0640 F:		**Pearl River** **New York**	Sample Received:	03/10/2022
				PLM Analysis Date:	03/10/2022
Contact:	**Marc Rutstein**	Sampled By:	M.R.	TEM Analysis Date:	03/11/2022
	M:	Sampled Date:	03/08/2022	Amended By:	Turiana Moreira
	E: Marc.Rutstein@ecmsny.com	Turnaround Time:	72 hrs	Amended Date:	03/14/2022

Summary of Analysis

LAB ID #	Client Sample #	Sample Description	Test	Fibrous Material	Non-Fibrous Material	Asbestos		Total Asbestos
11	8	Black / Blue Homogenous NOB 1ST FLOOR - HALL ADJ. STAFF ROOM - CARPET SQUARE	NY ELAP 198.1					
			NY ELAP 198.6			**Inconclusive**	**None Detected**	
			NY ELAP 198.4				**None Detected**	
12	9	Black / Blue Homogenous NOB 1ST FLOOR - HALL ADJ. STAFF ROOM - CARPET SQUARE	NY ELAP 198.1					
			NY ELAP 198.6			**Inconclusive**	**None Detected**	
			NY ELAP 198.4				**None Detected**	
13	10	Black Homogenous NOB 1ST FLOOR - OFFICE, ABOVE CEILING - INSULATION FELT	NY ELAP 198.1					
			NY ELAP 198.6			**Inconclusive**	**None Detected**	
			NY ELAP 198.4				**None Detected**	
14	11	Black Homogenous NOB 1ST FLOOR - OFFICE, ABOVE CEILING - INSULATION FELT	NY ELAP 198.1					
			NY ELAP 198.6			**Inconclusive**	**None Detected**	
			NY ELAP 198.4				**None Detected**	
15	12	Black Homogenous NOB 1ST FLOOR - OFFICE, ABOVE CEILING - ROOFING	NY ELAP 198.1					
			NY ELAP 198.6			**Inconclusive**	**None Detected**	
			NY ELAP 198.4				**None Detected**	
16	13	Black Homogenous NOB 1ST FLOOR - OFFICE, ABOVE CEILING - ROOFING	NY ELAP 198.1					
			NY ELAP 198.6			**Inconclusive**	**None Detected**	
			NY ELAP 198.4				**None Detected**	

Comments

Equipment: PLM SCOPE Nikon Optiphot-2
TEM SCOPE #2 - Hitachi H-7000

Zlatan Dimitrijevic
Laboratory Director

Reda Abdelmalak / Jose Perez
PLM Analyst

Hany Rezkalla
TEM Analyst

NYS ELAP ID # 12003

NVLAP Lab Code 500081-0

METRO ANALYTICAL LABORATORIES
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Report Notes

General Notes and Disclaimers

- The samples analyzed in this report were not collected by this laboratory - they were received from the client, or an agent of the client, in good condition, unless otherwise noted.
- All results are calculated based on client-provided samples and / or measurements and fall within the acceptable Quality Control limits, unless otherwise noted.
- The report shall not be reproduced, except in full, without the written approval of the laboratory.
- This report relates only to the samples tested. It may not be used by the client to claim project endorsement by NVLAP, NYS ELAP, or any other government agency.
- All samples will be properly disposed of after 60 days.
- Quality Control data (including 95% confidence limits, laboratory / analysis accuracy and precision) is available upon request.

Notes Regarding Asbestos Testing

- Air Sample Analysis by Phase Contrast Microscopy (PCM) adheres to Method NIOSH-7400. Results < 7 fibers / mm^2 are statistically insignificant.
- Percentages are calculated using the EPA equivalent Stratified Point-Count Method.
- Bulk Sample Analysis by Polarized Light Microscopy (PLM) Friable adheres to EPA/600/M4-082-20 or NYS ELAP 198.1.
- Bulk Sample Analysis by Polarized Light Microscopy (PLM) NOB adheres to NYS ELAP 198.6. This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite.
- All inhomogeneous layers of the bulk samples were analyzed separately.
- Analytical results are sometimes based on the residue percentage(s) provided by the client along with the filters. Trace denotes asbestos detected at < 1%. Smiliarly, samples below quantitation limit (RL) are reported with a less than sign (<).
- Polarized Light Microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Quantitative TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.
- Bulk Sample Analysis by Transmission Electron Microscopy (TEM) NOB adheres to NYS ELAP Method 198.4.
- Air Sample Analysis by Transmission Electron Microscopy (TEM) adheres to Method EPA CFR Part 763 Final Rule (AHERA).
- Air Sample Analysis by Transmission Electron Microscopy (TEM) Worksheets are available upon request.

Environmental Consulting and Management Services
Tel: 845-638-0640
Cell: 914-523-1523
info@ecmsny.com
www.ecmsny.com

R220303SA

Asbestos Inspection Bulk Sample Chain of Custody

Notes: Separate Layers, Always SFP/Type/Area. NOB/TEM = PLM; TEM if NEG by PLM

Client: Pearl River Library
Site: 80 Franklin Ave, Pearl River, NY
Scope of Work: Renovation
Analysis Time: 72 hrs
ECMS Job #:

Insp. Date: 3/2/22 Start/Stop 1630 / 1730
Client Tel/Cel: } Per File
Client Email: }
Client Address: }

Sample #	Sampled Material	Floor	Location	Requested Analysis	Est. Quantity	Gen. Condition	Field Notes
01-03A/B	SR/JC	1ST	OFFICE AREA	PLM	320 SF	Good	
04-05	C.Tile, 2x2		↓ ↓	NOB/TEM	1200 SF		
06-07	Fl. Tile 12x12		STAFF Room		400 SF		
08-09	CARPET SQUARES		Hall Adj STAFF Room		1200 SF		
10-11	Insulation Felt		OFFICE, Above Ceiling		1200 SF		
12-13	Roofing		↓ ↓ ↓		↓	↓	

Inspected By: [signature]
Received By:

Released By: [signature]
Received By: [signature] 3/10/22 3:10pm

EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018
Tel/Fax: (212) 290-0051 / (212) 290-0058
http://www.EMSL.com / manhattanlab@emsl.com

EMSL Order: 032205049
Customer ID: ECMS99
Customer PO:
Project ID:

Attention: Environmental Consulting & Mngt Svc.
10 Filmont Drive
e
New City, NY 10956

Phone: (845) 638-0640
Fax:
Received Date: 04/05/2022 5:58 PM
Analysis Date: 04/06/2022
Collected Date: 04/05/2022

Project: Pearl River Public Library/ 80 Franklin P.R. NY/ Mech. Room Work

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos
Sample ID T-1 *032205049-0001*		**Description** PH/ Mech Roof Top P.H. - Valve/Elbow Insulation **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	04/06/2022	Gray	40.00% Min. Wool	60.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID T-2 *032205049-0002*		**Description** PH/ Mech Roof Top P.H. - Valve/Elbow Insulation **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	04/06/2022	Gray	30.00% Min. Wool	30.00% Ca Carbonate 40.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID T-3 *032205049-0003*		**Description** PH/ Mech Roof Top P.H. - Valve/Elbow Insulation **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	04/06/2022	Gray	40.00% Min. Wool	20.00% Ca Carbonate 40.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID T-4 *032205049-0004*		**Description** PH/ Mech Roof Top P.H. - Valve/Elbow Insulation **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	04/06/2022	Gray	25.00% Min. Wool	30.00% Ca Carbonate 45.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID T-5 *032205049-0005*		**Description** PH/ Mech Roof Top P.H. - Valve/Elbow Insulation **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	04/06/2022	Gray	25.00% Min. Wool	35.00% Ca Carbonate 40.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**

Initial report from: 04/06/2022 11:02:05

EMSL Analytical, Inc.
307 West 38th Street New York, NY 10018
Tel/Fax: (212) 290-0051 / (212) 290-0058
http://www.EMSL.com / manhattanlab@emsl.com

EMSL Order:	032205049
Customer ID:	ECMS99
Customer PO:	
Project ID:	

Test Report:Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

Report Comments:

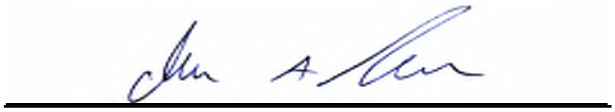
Sample Receipt Date:	4/5/2022	Sample Receipt Time:	5:58 PM
Analysis Completed Date:	4/6/2022	Analysis Completed Time:	1:42 AM

Analyst(s):

Ghaly Hemaya PLM NYS 198.1 Friable (3)

Migena Shehu PLM NYS 198.1 Friable (2)

Samples reviewed and approved by:

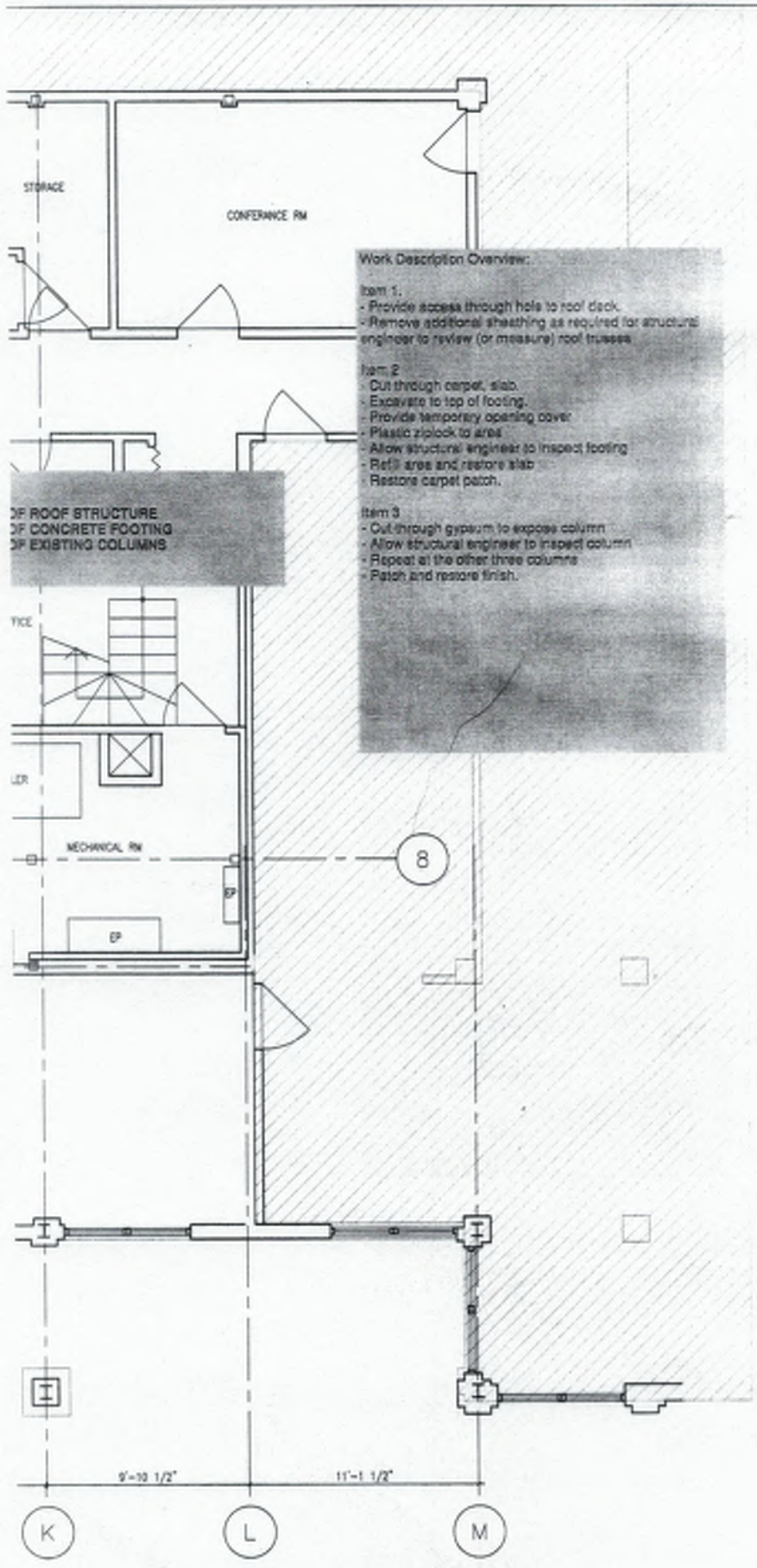


Charles Johnson, Asbestos Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. Estimation of uncertainty available upon request. This report is a summary of multiple methods of analysis, fully compliant reports are available upon request. All samples examined for the presence of vermiculite when analyzed via NYS 198.1. A combination of PLM and TEM analysis may be necessary to ensure consistently reliable detection of asbestos. Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. This report must not be used to claim product endorsement by NVLAP of any agency or the U.S. Government . Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing. NOB= Non friable organically bound; N/A= Not applicable VCM= Vermiculite containing material.

Samples analyzed by EMSL Analytical, Inc. New York, NY NYS ELAP 11506, NVLAP Lab Code 101048-9

Initial report from: 04/06/2022 11:02:05



Lothrop

Lothrop Associates LLP Architects
333 Westchester Avenue
White Plains, New York 10604
914-741-1115

White Plains Rochester Red Bank Hartford

ISSUE NO.	ISSUE DATE	DESCRIPTION
1	---	PROGRESS PRINT

PEARL RIVER PUBLIC LIBRARY CHILLER REPLACEMENT

GROUND FLOOR PLAN (EXISTING CONDITIONS)

PROJECT NO.:	2494-00	SCALE:	AS STATED

DRAWING NO.:

A090

1 GROUND FLOOR PLAN
1/4" = 1'-0"

SECTION 990002.02
APPENDIX COVER 'B2'

PEARL RIVER PUBLIC LIBRARY
80 Franklin Avenue
Pearl River, NY 10965

APPENDIX 'B2'
HAZARDOUS MATERIAL SURVEY REPORT 2 - ECMS

END OF SECTION

Environmental Consulting and Management Services
Tel: 845-638-0640
Cell: 914-523-1523
info@ecmsny.com
www.ecmsny.com

April 20, 2023

Bob Gabalski
Lothrop Associates LLP
333 Westchester Avenue
White Plains, New York 10604

d: 914.234.8402
c: 914.426.0107
e: bgabalski@lothropassociates.com

Re: Limited Asbestos & Lead Based Paint Inspection, Bathroom & Sitting Room @ Pearl River Library

Dear Bob & Kathleen:

As per your request and pursuant to our accepted proposal, on April 8, 2023, I visited the library, met with the office staff and we proceeded to the targeted bathroom/sitting area. The inspection was performed in response to upcoming renovations and the need to have suspect materials tested prior to renovation.

All collected samples were placed into sampling bags, labeled, recorded on our chain of custody, and submitted for analysis to Metro Testing Laboratory.

The specific materials encountered were sampled and tested:

Wall Sheetrock & Joint Compound
Ceiling 2x2 Lay-In Ceiling Tiles
Ceramic Floor Tiles
Ceramic Wall Tiles & Grout

Results:

Following analysis, the following results were reported:

Wall Sheetrock & Joint Compound	Negative
Ceiling 2x2 Lay-In Ceiling Tiles	Negative
Ceramic Floor Tiles	Negative
Ceramic Wall Tiles	Negative
Wall Tile Grout	**Positive**

Additionally, four samples for paint were sampled and tested for lead content, all samples were well below the CDC standard and deemed Negative for lead.

Discussion:

All sampled materials EXCEPT the wall tile grout were Negative for asbestos, Refer to Metro Report. Based upon the data and the homogeneity of the sampled materials, it is unlikely that any differing materials will be encountered and as such, the materials are deemed negative with no further testing required.

The wall tile/ceramic/grout must be abated as required, approximately 800 square feet on all walls requires removal by a licensed asbestos abatement company along with the required air monitoring.

Credentials:

ECMS inspectors performing the on-site inspection work are accredited within the State of New York for asbestos. Additionally, inspectors are also New York City Department of Environmental Protection Agency Certified Asbestos Inspectors. Environmental Consulting & Management Services, Inc. holds a New York State Department of Labor Contractor's Handling License, this is required to inspect and collect samples within NYS for asbestos. (Copies of licenses previously submitted).

If you have questions or require additional information, please contact me.

Sincerely,

Marc Rutstein

Marc Rutstein
President

SECTION 990002.03
APPENDIX COVER 'B3'

PEARL RIVER PUBLIC LIBRARY
80 Franklin Avenue
Pearl River, NY 10965

APPENDIX 'B3'
HAZARDOUS MATERIAL SURVEY REPORT 3 - OES

END OF SECTION

PRE-RENOVATION ASBESTOS, XRF LEAD PAINT AND PCB SCREEN REPORT

INVESTIGATION FOR**:**	Eugenia Schatoff Pearl River Public Library 80 Franklin Avenue Pearl River, NY 10965
SITE INVESTIGATED:	Pearl River Public Library 80 Franklin Avenue Pearl River, NY 10965 (Accessible Materials Only)
ASSESSMENT BY:	Omega Environmental Services, Inc. 280 Huyler Street South Hackensack, NJ 07606
INVESTIGATION CONDUCTED:	May 13 & 14, 2020
ASBESTOS INSPECTOR(S):	Eddy Montoya Gboyega Adewuyi
LEAD INSPECTOR(S):	Keri-Dean Scarlett
DATE OF REPORT:	June 10, 2020
REPORT PREPARED BY:	Ana Knezevic
REPORT REVIEWED BY:	Veronica Kero, CIH, P.E.

(Omega Project # 20-1125)

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

TABLE OF CONTENTS

EXECUTIVE SUMMARY:

Omega Environmental Services was retained by Pearl River Public Library to conduct a hazardous/regulated material investigation of the Pearl River Public Library located at 80 Franklin Avenue, Pearl River, NY 10965.

The inspection included a visual assessment, and representative sampling/analysis of suspect Asbestos Containing Materials (ACM), Lead Based Paint (LBP) and Polychlorinated Biphenyls (PCB's).

Previous Survey and Decontamination Work:

No documentation of any previous work performed specific to the Pearl River Public Library was provided.

Summary of Findings:

The following summarizes the hazardous or regulated materials identified:

Pearl River Public Library - Pre-Renovation Hazardous Material Summary			
Parameter Investigated	**Regulated Materials Identified**	**Estimated Total Quantity**	**Recommended Action**
Asbestos Containing Materials (ACM) in Accessible Components	Door Insulation White	Approx. 24 SF	- While the doors appeared to be similar, only a single semi-damaged door slab could be tested for ACM fill. Additional doors should be tested prior to removal
	Black Mastic on Floor	Approx. 5,500 SF	-
	Mastic Under Beige with Brown Streaks	Approx. 5,500 SF	-
	PACM – Mastic/Tar Paper on Lintels and Relieving Angles	TBD	- Access to concealed vapor barrier tar paper material was not available. Additional "go back" probe cut investigation required if material to be impacted
Positive Lead Based Paint (LBP) Components	None	None	-Conduct demolition activities in accordance with OSHA *Lead in Construction Standard.* -Beams with primer coating were not accessible for lead testing. If structural tie-in or other hot work to be conducted, any red primer coating on beams should be tested or assumed positive
PCBs	No PCB's approaching 50 *mg/kg* criteria reported for representative samples collected	Non-hazardous (<50 ppm)	-Contractor should verify that disposal facility will accept materials with low, non-hazardous levels of PCBs.
*If walls/ceilings/risers are to be opened for mechanical tie-in work, additional asbestos investigation required.			

1 ASBESTOS SURVEY:

1.1 Summary:

Omega Environmental Services, Inc. (Omega) was been retained by Pearl River Public Library to conduct an asbestos survey of Pearl River Public Library located at 80 Franklin Avenue, Pearl River, NY 10965 to confirm the presence/absence of accessible asbestos containing materials (ACM).

1.1.1 ACM identified:

Asbestos containing materials were identified during the 5/13 and 5/14/2020 inspection (accessible components only, no destructive testing).

1.2 Scope of Work:

Omega conducted a pre-renovation asbestos survey of Pearl River Public Library located at 80 Franklin Avenue such that asbestos containing materials (ACM) could be identified and abated prior to the onset of potential renovation activities as per *EPA NESHAPS*, *OSHA, and NYSDOL* requirements.

1.2.1 Materials Tested:

Considering the age of the building, it was determined that the following **suspect** asbestos-containing materials (ACM) were observed, and were subsequently **tested** for presence/absence of asbestos:

- 12x12 Beige with Brown Streaks
- 12x12 White Tile
- 12x12 White Tile with Yellow Streaks
- 2x2 Ceiling Tile Bumpy Popcorn
- 2x2 Ceiling Tile Pinholes
- Black Mastic on Floor
- Boiler Unit Insulation Around Flute
- Caulking Above Metal Flashing
- Cementitious Material on Deck
- CMU
- CMU Mortar
- Concrete Slab
- Door Insulation White
- Drywall
- Duct Caulking on Joints – Gold
- Duct Caulking on seams- Beige
- Fittings
- Flashing – White
- Floor Grout
- Glue Under Carpet
- Gray Duct Sealant on Duct Joints
- Green Gasket
- HVAC Unit Bedding Caulk – Black
- Interior Window Glazing
- Joint Compound
- Mastic on CMU
- Mastic Under Beige with Brown Streaks
- Mastic Under White Tile with Yellow Streaks
- Red Gasket
- Roofing Material
- Sink Undercoating – White
- Skylight Window Caulk
- Vibration Cloth - White
- Wall Grout
- Window Glazing Black

Positive ACM materials above are highlighted.

1.2.2 Non-ACM:

The following materials were sampled, analyzed and identified to be **non-ACM**, with asbestos either not detected or detected in concentrations of less than one percent (1%):

- 12x12 Beige with Brown Streaks
- 12x12 White Tile
- 12x12 White Tile with Yellow Streaks
- 2x2 Ceiling Tile Bumpy Popcorn
- 2x2 Ceiling Tile Pinholes
- Boiler Unit Insulation Around Flute
- Caulking Above Metal Flashing
- Cementitious Material on Deck
- CMU
- CMU Mortar
- Concrete Slab
- Drywall
- Duct Caulking on Joints – Gold
- Duct Caulking on seams- Beige
- Fittings
- Flashing – White
- Floor Grout
- Glue Under Carpet
- Gray Duct Sealant on Duct Joints
- Green Gasket
- HVAC Unit Bedding Caulk – Black
- Interior Window Glazing
- Joint Compound
- Mastic on CMU
- Mastic Under White Tile with Yellow Streaks
- Red Gasket
- Roofing Material
- Sink Undercoating – White
- Skylight Window Caulk
- Vibration Cloth - White
- Wall Grout
- Window Glazing Black

1.3 Sampling Methodology:

The information that is contained in this report is based upon the following:

- Information which was provided by the building representatives interviewed.
- A visual inspection of the designated building areas supported by a representative sampling required to comply with EPA protocol for asbestos building surveys.
- Laboratory analysis of bulk samples of various materials collected from representative building areas that were suspected to contain asbestos. An accredited laboratory using PLM and TEM/NOB analysis methods performed the analysis.

The asbestos survey was conducted on May 13 and 14, 2020 by accredited USEPA AHERA Asbestos Inspectors. The bulk samples, which were representative of suspect ACM observed and are required by the USEPA, were collected as necessary. Multiple samples of each homogeneous material were collected and analyzed by each discernible layer. According to USEPA, a building material with an asbestos concentration greater than one percent (>1%) is considered to be ACM.

Bulk samples were submitted to ELAP accredited Laboratory Testing Services / accreditation # 10955 and Omega Laboratories / accreditation # 10504 utilizing sealed chain-of-custody procedures.

1.4 Unknown Variables/Areas Not Accessible for Sampling:

Exclusions/exemptions/assumptions

- **Bulk sampling was limited to accessible materials in the Pearl River Public Library only.**
- Enclosed walls/ceilings/chase assemblies. Additional concealed materials may exist.
- Boiler/mechanical system interiors.
- Façade/roof layers.

1.5 Review of Previous Asbestos Surveys, Renovations or Abatement Work:

No reports specific to the Pearl River Public Library.

1.6 Sampling Limitations/Conditions:

The following limitations/exclusions apply:

1. Asbestos bulk sampling report should not be used as sole reference source to determine Contractor scope of work – additional field coordination required in order to generate "Abatement Work Plan".
2. If scope of renovation changes, and/or walls/ceilings/chases/flooring opened, then additional asbestos bulk sampling may be required at a later date.
3. All sampling is representative in nature and does not reflect every square inch of material.
4. Findings are representative of site conditions on day of investigation.
5. Subject survey conducted according to published regulations in effect on survey date.

1.7 ACM Conclusions and Recommendations

Conclusions:

1. Asbestos containing materials were identified during the 5/13 and 5/14/2020 inspection.
2. Asbestos abatement activities must be conducted in accordance with NYCDEP Regulations, and other applicable federal, state and local requirements governing removal and disposal of regulated ACM utilizing licensed workers.

Recommendations:

- Any building material that is not listed in this report and/or tested must be assumed to be ACM and treated as ACM until confirmed otherwise via laboratory testing.

2 LEAD BASED PAINT (LBP):

2.1 XRF Testing:

2.1.1 XRF Summary:

On May 14, 2020 Omega Environmental Services Inc. (Omega) conducted a lead-based paint screen survey using XRF (x-ray fluorescence). Representative painted building and site components were classified as having lead-based (LBP) or non-LBP present. The inspection was intended for pre-renovation survey purposes only, and not intended to follow USEPA HUD protocol, and was not designed for certification or occupancy purposes.

The presence of LBP in the buildings indicates that the demolition Contractor should follow OSHA *Lead in Construction Standard* (LCS). LBP on metal components that are to be torch cut in relation to demolition should be abated in the area of the cut points prior to cutting. Other materials that may have LBP do not require special treatment. Intact LBP coated components may be disposed of intact as normal construction debris contingent upon acceptable representative TCLP lead test results.

2.1.2 XRF Sampling Methodology:

Omega performed XRF screening for lead within the subject building using a Heuresis Corp. Pb200i XRF Lead Paint Analyzer. The inspection was conducted by Keri-Dean Scarlett, an EPA Lead Inspector/Risk Assessor.

Omega's certified lead Inspector/Risk Assessor performed a lead-based paint (LBP) inspection of representative accessible building areas so that presence/absence of LBP can be verified for the subject building in areas which is expected to be demolished to grade.

2.1.3 XRF Clearance Criteria:

The USEPA defines Lead Based Paint as paint having a lead level equal to or exceeding 1.0 mg/cm^2.

2.1.4 XRF Results Summary:

The XRF results section of this report provides a listing of all the reading collected during the inspection, organized by building, component, and type of material. The positive readings, if any, are highlighted and include those readings that were at or above the action level 1.0 mg/cm^2.

The following components **were found to be covered with lead containing paint/primer**:

No LBP was identified.

LBP ***was not*** identified on the following components:

Location	Component	Type of Material	Quantity of Non-LBP Results
Staff Breakroom	Wall	Drywall	2
	Baseboard	Wood	1
	Window Frame	Wood	1
Administrative Offices	Door Buck	Metal	1
Director's Office	Door Buck	Metal	1
	Baseboard	Wood	1
	Wall	Drywall	2
Children's Room	Vent	Metal	1
	Window Case	Wood	1
	Wall	Drywall	1
	Baseboard	Wood	1
Toddler Room	Baseboard	Wood	2
	Wall	Drywall	2
	Door Casing	Metal	1
Coat Room	Wall	Drywall	2
	Electrical Panel Frame	Metal	1
Unisex Bathroom	Wall	Drywall	1
Staff Work Space	Wall	Drywall	1
	Baseboard	Wood	1
	Door Casing	Metal	1
Mechanical Room	Stair Railing	Metal	1
	Stair Risers	Metal	1
	Stair Stringer	Metal	1
	Stair Railing	Metal	1
	Door Frame	Metal	1
	Door	Metal	1
Conference Room	Door Frame	Metal	1
	Wall	Drywall	1
	Baseboard	Wood	1
Story Time Room	Baseboard	Wood	1
	Wall	Drywall	4
	Door Outer Casing	Metal	4
Conference Room	Door Outer Casing	Metal	2
Community Room	Wall	Drywall	1
	Baseboard	Wood	1
	Window Case	Wood	1
Hallway Ceiling by Mech. Room	Ceiling	Concrete	1
	Beam	Metal	1

Supply & Storage Room	Wall	Drywall	2
Book Sale Space	Wall	Drywall	1
	Baseboard	Wood	1
	Door Casing	Metal	1
Circ Desk Area	Vent	Metal	1
	Wall	Drywall	2
	Baseboard	Wood	1
	Window Case	Wood	1
New Materials Area	Column	Drywall	1
	Wall	Drywall	1
	Baseboard	Drywall	1
Pearl River Room	Baseboard	Drywall	1
	Wall	Drywall	1
	Door	Wood	1
Teen Area	Wall	Drywall	1
	Baseboard	Wood	1
	Column	Drywall	1
Learning Lab	Wall	Drywall	1
	Vent	Metal	1
Reading Areas	Column	Drywall	1
	Wall	Metal	1
	Wall	Drywall	1
Exterior Frame	Support Column Trim	Wood	1
	Ceiling	Wood	1
Exterior Service Entrance	Exterior Door	Metal	1
Exterior Front Entrance	Trim	Wood	1
	Ceiling	Wood	1
	Door Frame	Wood	1

See *Appendix Table B1* for all XRF reading collected and specific location of each.

NOTE: Lead Based Paint (LBP) via XRF testing is defined as paint having lead at or above 1 mg/cm^2. **However, OSHA *Lead in Construction Standard* applies to substrates coated with paint having *any detectable amount of lead*.**

2.2 LBP Findings:

The USEPA defines Lead Based Paint as paint having a lead level equal to or exceeding 1.0 mg/cm^2.

2.3 LBP Recommendations:

- Remove LBP components in accordance with OSHA Lead in Construction Standard.
- **Higher risk lead work tasks such as open power sanding, torch cutting, or burning should not be performed in an occupied or soon-to-be occupied school building.**
- **Metal door slabs with lead-based paint are typically un-hung and taken off-site for stripping followed by re-installation, or the painted component is sent for off-site recycling.**
- **If/when the renovation Contractor has no trained/certified lead crew, the handling of lead-based paint components may be contracted/sub-contracted to an Abatement Contractor.**

3 PCBs:

3.1 Window Caulking:

Omega Environmental Services, Inc. (Omega) conducted a limited screen survey focusing on window caulk for suspect Polychlorinated Biphenyls (PCB's). The purpose of the inspection was to confirm the presence/absence of PCB materials which could potentially be impacted by the renovation activities. Omega collected representative bulk samples of window and door caulk for analysis.

Three (3) representative samples were collected of window and door caulking and analyzed for PCB's. *The sample results were below 50 parts per million PCBs.*

3.1.1 Sampling Methodology:

It should be noted that there is currently no mandatory sampling frequency for collection of PCB caulk/sealant samples, as there is for asbestos.

The enclosed information will primarily assist you in identifying the location(s) of materials tested during the inspection. It should not be used to assess whether an individual has been exposed to harmful levels and/ or the future for potential for future exposure.

3.1.2 Analytical Methodology:

Samples collected were analyzed for PCBs according to *Method 3540C/8082/8080.*

3.1.3 Clearance Criteria:

Materials containing greater than 50 parts per million are considered PCB Bulk Product Waste and would need to be addressed separately prior to demolition activities

3.1.4 Results Summary Table:

Below are the results and the location of each sample.

"**Individual PCBs" in the table below consist of the following:**
Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Aroclor 1262
Aroclor 1268

Sample #	Location/description	Result (total PCB)	Reg. Level
01	Caulking	None Detected	50 mg/kg
02	Caulking	None Detected	50 mg/kg
03	Caulking	None Detected	50 mg/kg

3.2 PCB Conclusions and Recommendations:

Samples collected reported results below the 50 mg/kg hazardous waste classification criteria. Contractor should verify that disposal facility will accept materials with low, non-hazardous levels of PCBs.

4 SUMMARY OF RECOMMENDATIONS:

4.1 ACM Recommendations:

- Any building material that is not listed in this report and/or tested must be assumed to be ACM and treated as ACM until confirmed otherwise via laboratory testing.

4.2 LBP Recommendations:

- Remove LBP components in accordance with OSHA Lead in Construction Standard.
- **Higher risk lead work tasks such as open power sanding, torch cutting, or burning should not be performed in an occupied or soon-to-be occupied school building.**
- **Metal door slabs with lead-based paint are typically un-hung and taken off-site for stripping followed by re-installation, or the painted component is sent for off-site recycling.**
- **If/when the renovation Contractor has no trained/certified lead crew, the handling of lead-based paint components may be contracted/sub-contracted to an Abatement Contractor.**

4.3 PCB Recommendations:

- Contractor should verify that disposal facility will accept materials with low, non-hazardous levels of PCBs.
- If PCB caulk is removed and substrate remains, the substrate must have *no detectable level* of PCBs (according to TSCA).

A. Asbestos (ACM)

A1. Analytical Methodology
A2. Table of Sample Results
A3. Asbestos Laboratory Analytical Reports

A1. Analytical Methodology:

Definitions:

ACM: asbestos containing material
RACM: regulated asbestos containing material
VCM: vermiculite containing material
TSI: thermal system insulation (pipe insulation)
SSI: surfacing material (spray-on fireproofing, plaster, etc.)
Miscellaneous finish material: sheetrock, floor tile, roofing, other
NOB: non-organically bound non-friable material (e.g. roofing, floor tile, etc.)

Friable vs. Non-friable**:**

1. A friable material is one that can be easily crumbled, pulverized, or reduced to powder by hand pressure. This characteristic of a building material is directly linked to the potential of the material to release asbestos fibers into the air.
2. Non-friable are the materials that are organically bound normally fall into this category as long as they are in good condition. Some of the materials, which would be defined as non-friable material, include floor tiles, roofing materials, mastic, etc. Non-friable ACM are categorized into two (2) categories by USEPA: Category I non-friable materials, such as resilient floor tiles, and roofing materials are not expected to become friable when disturbed. Non-friable ACM, such as laboratory table tops and transite siding/paneling, are considered to be a category II non-friable ACM.

Criteria for Positive Classification as Regulated Asbestos Containing Material (RACM):

Asbestos containing material (ACM)

The EPA defines ACM as any material having an Asbestos content greater than 1%. If the analytical results for any sample of suspected material indicate that asbestos is present above a level of one percent, the building material is classified as regulated ACM (RACM) which triggers management and/or abatement, if impacted.

Vermiculite (VCM)

Related to cross-contamination in the mining industry, as well as new concerns about Amphibole minerals with crystalline structure similar to Asbestos, bulk samples found to contain greater than or equal to ten percent Vermiculite require further classification *in NYS/NYC*. Vermiculite is not currently regulated in New Jersey.

Representative Nature of All Sampling:

The purpose of bulk sampling is to characterize representative materials, not remove and test every square inch of material. The Inspector/Investigator uses a combination of EPA recommended bulk sampling criteria and professional judgment to select representative sampling locations of each suspect material type. In certain rare cases, building materials may appear to be homogeneous (e.g. plaster, roofing, etc.) but vary section to section due to patching, different installation methods floor-to-floor, and other causes. Additional testing beyond normal survey protocol can be required for these scenarios.

HOMOGENEOUS AREAS: A homogeneous area is a portion of a building/structure with similar/same installed materials such that bulk analysis results from one area can be applied in the next for the purpose of asbestos quantification.

'FIRST POSITIVE STOP': In order to reduce unnecessary survey laboratory analysis costs when samples are collected in groups of three (3) or two (2), as required by EPA sampling criteria, when the first or second sample is reported as positive in a group, then the additional samples are declared positive with no analysis.

SAMPLING FROM SLAB UP: Because older/original bottom layer materials are more likely to contain asbestos versus newer layers, materials such as floor tiles and roofing are sampled from the slab up. If a positive lower or middle layer is identified, all materials in the layered system can be declared ACM if they cannot be separated during the abatement process.

SHEETROCK JOINT COMPOUND TESTING: Since most sheetrock wallboard systems are painted, it is difficult to impossible to assess where one type of material starts and ends. EPA has published memos concerning composite sampling that were not approved by OSHA which requires discrete sampling. This agency does not recognize composite testing of joint compound for the purpose of preventing employee exposure. NYSDOL also requires separate sampling of joint compound. The PLM analysis method has been generally utilized for this material type, where samples in the trace-1% inconclusive range are also run by TEM-NOB for additional accuracy.

Non-friable asbestos samples collected are analyzed using the TEM-NOB method of analysis, as required by regulation.

Upon completion of the sampling, the samples were submitted to an accredited approved laboratory for analysis. The samples were divided into batches and analyzed by EPA Method 600/MA-82-020, Polarized Light Microscopy with dispersion staining. The percentage of each type of asbestos was determined and any remaining materials were identified. The U.S. Environmental Agency defines ACM as having an asbestos content of greater $\geq$ than 1%. If the analytical results for any sample of suspected material indicate that asbestos is present above a level of one percent, the building material is considered to contain asbestos.

1. Stereoscope Examination:

Working under a designated bulk asbestos laboratory hood, a sample is carefully poured onto the stage of the stereoscope for examination to determine if the sample is homogeneous and fibrous.

2. Slide Preparation:

A slide of each component in the sample is prepared using as little matrix material as possible. Samples are mounted on microscope slides in high dispersion refractive index liquids. For asbestos analysis, the sample is initially mounted in liquids with refractive indexes of (η) of 1.550, close to that of chrysotile asbestos. Liquids of higher refractive index may also be required for determining other asbestos forms.

3. PLM Examination:

Each slide is examined under a high quality polarized light microscope (20x-55x objective). A dispersion staining objective is also used.

The samples are first examined under plane polarizing light with the condenser set at zero. The morphology and relief of the fibers and matrix materials are observed. Next the analyzer is inserted for examination under the cross polars. Determinations are made if the fibers are isotropic or opaque with the angle of extinction noted. The condenser plate may also be inserted to produce retardation colors, depending on birefringence of the material. The sign of elongation is also determined at this time.

Refractive index is determined by matching a particular fiber with a refractive index liquid of the closest refractive index. The Becke line test is also used to cheek the refractive index. Dispersion staining is used to further characterize the components of a sample.

4. Identification of Asbestos:

Chrysotile

Chrysotile, which is the most common asbestos-form, is easily identified in liquid of refractive index 1.550 by its characteristic morphology (fibrous bundles with kinked bends) and dispersion staining colors (blue-magenta).

Amosite

Amosite is identified in 1.688 refractive index liquid by morphology (straight fibers with broomed ends) and dispersion staining colors (blue-yellow).

Crocidolite

The straight or bundled fibers of crocidolite (amphibole) are pleochroic; they appear blue-grey under plane polarized light. The fibers show negative sign of elongation and an index of refraction approaching 1.680.

Other Asbestos-Forms

Other fibrous amphiboles, which differ in refractive index from amosite, are anthophyllite

(η= 1.605), tremolite (η= 1.605), and actinolite (η= 1.680).

5. TEM/NOB Analysis:

Due to matrix interference, NJDOL requires all non-friable materials tested (i.e., floor tiles, asphalt roofing, mastics, etc.) undergo TEM (transmission electron microscopy)/NOB EPA 600/R-93/116 (non-organically bound) analysis NY ELAP 198.4 Method. This analysis method, which is conducted by an accredited independent testing laboratory, includes ashing of the sample matrix to reduce binder interference to provide a lower detection limit.

A2. Asbestos Bulk Sampling & Analysis Results of Areas Inspected:

According to EPA definition a material that contains 1% or greater asbestos content is classified as regulated ACM. Representative bulk sampling and analysis was conducted of the following:

SAMPLE ID	HA	SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON-FRIABLE	LAB RESULTS	
					%Asbestos	%Vermiculite
5/13/2020						
1	1	2nd Floor – Boiler Room	Fittings	Friable	None Detected	None Detected
2	1	2nd Floor – Boiler Room	Fittings	Friable	None Detected	None Detected
3	1	2nd Floor – Boiler Room	Fittings	Friable	None Detected	None Detected
4	2	2nd Floor – Boiler Room	CMU	Friable	None Detected	None Detected
5	2	1st Floor – Library Area	CMU	Friable	None Detected	None Detected
6	3	2nd Floor – Boiler Room	CMU Mortar	Friable	None Detected	None Detected
7	3	1st Floor – Library Area	CMU Mortar	Friable	None Detected	None Detected
8	3	2nd Floor – Boiler Room	CMU Mortar	Friable	None Detected	None Detected
9	4	2nd Floor – Boiler Room	Duct Caulking on Seams- Beige	Non-Friable	None Detected	None Detected
10	4	2nd Floor – Boiler Room	Duct Caulking on Seams- Beige	Non-Friable	None Detected	None Detected
11	5	2nd Floor – Boiler Room	Duct Caulking on Joints – Gold	Non-Friable	None Detected	None Detected
12	5	1st Floor – Library Area	Duct Caulking on Joints – Gold	Non-Friable	None Detected	None Detected
13	6	2nd Floor – Boiler Room	Vibration Cloth - White	Friable	None Detected	None Detected
14	6	2nd Floor – Boiler Room	Vibration Cloth - White	Friable	None Detected	None Detected
15	6	2nd Floor – Boiler Room	Vibration Cloth - White	Friable	None Detected	None Detected
16	7	2nd Floor – Boiler Room	Concrete Slab	Friable	None Detected	None Detected
17	7	1st Floor – Library Area	Concrete Slab	Friable	None Detected	None Detected
18	8	2nd Floor – Boiler Room	Interior Window Glazing	Non-Friable	None Detected	None Detected
19	8	1st Floor – Library Area-Offices	Interior Window Glazing	Non-Friable	None Detected	None Detected
20	9	2nd Floor – Boiler Room	HVAC Unit Bedding Caulk – Black	Non-Friable	None Detected	None Detected
21	9	2nd Floor – Boiler Room	HVAC Unit Bedding Caulk – Black	Non-Friable	None Detected	None Detected

22	10	2nd Floor – Boiler Room	Red Gasket	Non-Friable	None Detected	None Detected
23	10	2nd Floor – Boiler Room	Red Gasket	Non-Friable	None Detected	None Detected
24	11	2nd Floor – Boiler Room	Green Gasket	Non-Friable	None Detected	None Detected
25	11	2nd Floor – Boiler Room	Green Gasket	Non-Friable	None Detected	None Detected
26	12	2nd Floor – Boiler Room	Gray Duct Sealant on Duct Joints	Non-Friable	None Detected	None Detected
27	12	1st Floor – Bathroom Area	Gray Duct Sealant on Duct Joints	Non-Friable	None Detected	None Detected
28	13	2nd Floor – Boiler Room	Mastic on CMU	Non-Friable	None Detected	None Detected
29	13	2nd Floor – Boiler Room	Mastic on CMU	Non-Friable	None Detected	None Detected
30	14	2nd Floor – Boiler Room	Drywall	Friable	None Detected	None Detected
31	14	1st Floor – Library Area – Offices	Drywall	Friable	None Detected	None Detected
32	15	2nd Floor – Boiler Room	Joint Compound	Friable	None Detected	None Detected
33	15	1st Floor – Library Area – Offices	Joint Compound	Friable	None Detected	None Detected
34	15	1st Floor – Library Area	Joint Compound	Friable	None Detected	None Detected
35	15	1st Floor – Kitchen Area	Joint Compound	Friable	None Detected	None Detected
36	15	1st Floor – Conference Room	Joint Compound	Friable	None Detected	None Detected
37	16	1st Floor – Boiler Room	Door Insulation White	Friable	14.8% Chrysotile 8.20% Amosite	None Detected
38	16	1st Floor – Boiler Room	Door Insulation White	Friable	Positive Stop	-
39	17	1st Floor – Boiler Room	Black Mastic on Floor	Non-Friable	3.65% Chrysotile	None Detected
40	17	1st Floor – Back Janitor Hall	Black Mastic on Floor	Non-Friable	Positive Stop	-
41	18	1st Floor – Boiler Room	Boiler Unit Insulation Around Flute	Friable	None Detected	None Detected
42	18	1st Floor – Boiler Room	Boiler Unit Insulation Around Flute	Friable	None Detected	None Detected
43	19	1st Floor – Janitor Conference Room	Glue Under Carpet	Non-Friable	Trace Chrysotile	None Detected
44	19	1st Floor – Janitor Conference Room	Glue Under Carpet	Non-Friable	Trace Chrysotile	None Detected
45	20	1st Floor – Janitor Conference Room	2x2 Ceiling Tile Bumpy Popcorn	Non-Friable	None Detected	None Detected
46	20	1st Floor – Library Area	2x2 Ceiling Tile Bumpy Popcorn	Non-Friable	None Detected	None Detected
47	21	1st Floor – Addition Area	2x2 Ceiling Tile Pinholes	Non-Friable	None Detected	None Detected
48	21	1st Floor – Conference Room	2x2 Ceiling Tile Pinholes	Non-Friable	None Detected	None Detected

49	22	1st Floor – Janitor Conference Room	Cementitious Material on Deck	Friable	None Detected	None Detected
50	22	1st Floor – Janitor Conference Room	Cementitious Material on Deck	Friable	None Detected	None Detected
51	22	1st Floor – Janitor Conference Room	Cementitious Material on Deck	Friable	None Detected	None Detected
52	23	1st Floor – Storage Closet	Mastic Under Beige with Brown Streaks	Non-Friable	6.97 % Chrysotile	None Detected
53	23	1st Floor – Storage Closet	Mastic Under Beige with Brown Streaks	Non-Friable	Positive Stop	-
54	24	1st Floor – Storage Closet	12x12 Beige with Brown Streaks	Non-Friable	None Detected	None Detected
55	24	1st Floor – Storage Closet	12x12 Beige with Brown Streaks	Non-Friable	None Detected	None Detected
56	25	1st Floor – Office of Conference Room	Mastic Under White Tile with Yellow Streaks	Non-Friable	None Detected	None Detected
57	26	1st Floor – Office of Conference Room	12x12 White Tile with Yellow Streaks	Non-Friable	None Detected	None Detected
58	25	1st Floor – Office of Conference Room	Mastic Under White Tile with Yellow Streaks	Non-Friable	None Detected	None Detected
59	26	1st Floor – Office of Conference Room	12x12 White Tile with Yellow Streaks	Non-Friable	None Detected	None Detected
60	27	1st Floor – Lobby	Floor Grout	Friable	None Detected	None Detected
61	27	1st Floor – Lobby	Floor Grout	Friable	None Detected	None Detected
62	28	1st Floor - Lobby	Wall Grout	Friable	None Detected	None Detected
63	28	1st Floor – Bathroom Area	Wall Grout	Friable	None Detected	None Detected
64	29	1st Floor – Library – Offices	Window Glazing Black	Non-Friable	None Detected	None Detected
65	29	1st Floor – Library – Offices	Window Glazing Black	Non-Friable	None Detected	None Detected
66	30	1st Floor – Addition Area	Glue Under Carpet	Non-Friable	None Detected	None Detected
67	30	1st Floor – Addition Area	Glue Under Carpet	Non-Friable	None Detected	None Detected
68	31	1st Floor – Employee Entrance	12x12 White Tile	Non-Friable	None Detected	None Detected
69	31	1st Floor – Employee Entrance	12x12 White Tile	Non-Friable	None Detected	None Detected
70	32	1st Floor – Kitchen	Sink Undercoating – White	Non-Friable	None Detected	None Detected
71	32	1st Floor - Kitchen	Sink Undercoating – White	Non-Friable	None Detected	None Detected
5/14/2020						
72	33	Roof – Elevation 1 Lowest	Roofing Material	Non-Friable	None Detected	None Detected
73	33	Roof – Elevation 1 Lowest	Roofing Material	Non-Friable	None Detected	None Detected
74	34	Roof – Elevation 1 Lowest	Flashing – White	Non-Friable	None Detected	None Detected
75	34	Roof – Elevation 1 Lowest	Flashing – White	Non-Friable	None Detected	None Detected

76	35	Roof – Elevation 1 Lowest	Caulking Above Metal Flashing	Non-Friable	None Detected	None Detected
77	35	Roof – Elevation 2 Middle	Caulking Above Metal Flashing	Non-Friable	None Detected	None Detected
78	36	Roof – Elevation 2 Middle	Roofing Material	Non-Friable	None Detected	None Detected
79	36	Roof – Elevation 2 Middle	Roofing Material	Non-Friable	None Detected	None Detected
80	37	Roof – Elevation 2 Middle	Flashing – White	Non-Friable	None Detected	None Detected
81	37	Roof – Elevation 2 Middle	Flashing – White	Non-Friable	None Detected	None Detected
82	38	Roof – Elevation 3 Top	Roofing Material	Non-Friable	None Detected	None Detected
83	38	Roof – Elevation 3 Top	Roofing Material	Non-Friable	None Detected	None Detected
84	39	Roof – Elevation 3 Top	Flashing – White	Non-Friable	None Detected	None Detected
85	39	Roof – Elevation 3 Top	Flashing – White	Non-Friable	None Detected	None Detected
86	40	Roof – Elevation 3 Top	Skylight Window Caulk	Non-Friable	None Detected	None Detected
87	40	Roof – Elevation 3 Top	Skylight Window Caulk	Non-Friable	None Detected	None Detected

A3. Asbestos Laboratory Analytical Reports:

LABORATORY TESTING SERVICES INC. 48-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389-3430, FAX: (718) 389-3431

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY Project #: 20-1125
Laboratory ID: 20-05-084	**Date of Report:** 05/20/20	**Date of Analysis:** 05/19/20

Client ID # / Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
9	A	BE	E		2nd Floor, Boiler Room, Duct Caulking On Seams-Beige				17.69	NAD		NAD		NAD
	B	1	F											
20-05-084-01	C	198.4/6	G											
	D		H											
10	A	BE	E		2nd Floor, Boiler Room, Duct Caulking On Seams-Beige				30.95	NAD		NAD		NAD
	B	1	F											
20-05-084-02	C	198.4/6	G											
	D		H											
11	A	GL	D		2nd Floor, Boiler Room, Duct Caulking On Joints-Gold				21.67	NAD		NAD		NAD
	B	1	F											
20-05-084-03	C	198.4/6	G											
	D		H											
12	A	GL	D		1st Floor, Library Area, Duct Caulking On Joints-Gold				7.29	NAD		NAD		NAD
	B	1	F											
20-05-084-04	C	198.4/6	G											
	D		H											
18	A	WH	E		2nd Floor, Boiler Room, Interior Window Glazing				19.97	NAD		NAD		NAD
	B	1	F											
20-05-084-05	C	198.4/6	G											
	D		H											
19	A	WH	E		1st Floor, Library Area-Offices, Interior Window Glazing				25.12	NAD		NAD		NAD
	B	1	F											
20-05-084-06	C	198.4/6	G											
	D		H											

LABORATORY TESTING SERVICES INC. 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3420, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY **Project #:** 20-1125
Laboratory ID: 20-05-084	**Date of Report:** 05/20/20	**Date of Analysis:** 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
20 20-05-084-07	A	BK	E		2nd Floor, Boiler Room, HVAC Unit Bedding Caulk-Black				37.99	NAD		NAD		NAD
	B	1	F											
	C	198.4/6	G											
	D		H											
21 20-05-084-08	A	BK	E		2nd Floor, Boiler Room, HVAC Unit Bedding Caulk-Black				36.45	NAD		NAD		NAD
	B	1	F											
	C	198.4/6	G											
	D		H											
22 20-05-084-09	A	R	E		2nd Floor, Boiler Room, Red Gasket				39.78	NAD		NAD		NAD
	B	1	F											
	C	198.4/6	G											
	D		H											
23 20-05-084-10	A	R	E		2nd Floor, Boiler Room, Red Gasket				43.37	NAD		NAD		NAD
	B	1	F											
	C	198.4/6	G											
	D		H											
24 20-05-084-11	A	GN	E		2nd Floor, Boiler Room, Green Gasket				57.50	NAD		NAD		NAD
	B	1	F											
	C	198.4/6	G											
	D		H											
25 20-05-084-12	A	GN	F		2nd Floor, Boiler Room, Green Gasket				57.34	NAD		NAD		NAD
	B	1	F											
	C	198.4/6	G											
	D		H											

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		Project: 60 Franklin Avenue, Pearl River NY	Project #: 20-1125
Laboratory ID: 20-05-084	Date of Report: 05/20/20	Date of Analysis: 05/19/20	

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% AH	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
26	A	GR	E		2nd Floor, Boiler Room, Gray Duct Sealant On Duct Joints				5.46	NAD		NAD		NAD
	B	1	F											
20-05-084-13	C	198.4/6	G											
	D		H											
27	A	GR	E		1st Floor, Bathroom Area, Gray Duct Sealant On Duct Joints				6.61	NAD		NAD		NAD
	B	1	F											
20-05-084-14	C	198.4/6	G											
	D		H											
28	A	BK	E		2nd Floor, Boiler Room, Mastic On CMU				13.98	NAD		NAD		NAD
	B	1	F											
20-05-084-15	C	198.4/6	G											
	D		H											
29	A	BK	E		2nd Floor, Boiler Room, Mastic On CMU				6.73	NAD		NAD		NAD
	B	1	F											
20-05-084-16	C	198.4/6	G											
	D		H											
39	A	BK	E		1st Floor, Boiler Room, Black Mastic On Floor				18.23	NAD		3.65	CH	3.65
	B	1	F											
20-05-084-17	C	198.4/6	G											
	D		H											
40	A	BK	E		1st Floor, Back Janitor Hall, Black Mastic On Floor				15.53	NAD		NA		SAPP
	B	1	F											
20-05-084-18	C	198.6	G											
	D		H											

LABORATORY TESTING SERVICES INC - 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3470, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY **Project #:** 20-1125
Laboratory ID: 20-05-084	**Date of Report:** 05/20/20	**Date of Analysis:** 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
43	A	BK	E		1st Floor, Janitor Conference Room, Glue Under Carpet				26.17	NAD		TRACE	CH	TRACE
	B	T	F											
20-05-084-19	C	198.4/6	G											
	D		H											
44	A	BK	E		1st Floor, Janitor Conference Room, Glue Under Carpet				99.98	NAD		TRACE	CH	TRACE
	B	T	F											
20-05-084-20	C	198.4/6	G											
	D		H											
45	A	GR	E		1st Floor, Janitor Conference Room, 2x2 Ceiling Tile Bumpy Popcorn				54.75	NAD		NAD		NAD
	B	T	F											
20-05-084-21	C	198.4/6	G											
	D		H											
46	A	GR	E		1st Floor, Library Area, 2x2 Ceiling Tile Bumpy Popcorn				47.11	NAD		NAD		NAD
	B	T	F											
20-05-084-22	C	198.4/6	G											
	D		H											
47	A	GR	E		1st Floor, Addition Area, 2x2 Ceiling Tile Pinholes				53.35	NAD		NAD		NAD
	B	T	F											
20-05-084-23	C	198.4/6	G											
	D		H											
48	A	GR	E		1st Floor, Conference Room, 2x2 Ceiling Tile Pinholes				69.27	NAD		NAD		NAD
	B	T	F											
20-05-084-24	C	198.4/6	G											
	D		H											

LABORATORY TESTING SERVICES INC. 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3470, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY **Project #:** 20-1125
Laboratory ID: 20-05-084	**Date of Report:** 05/20/20	**Date of Analysis:** 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
52	A	BR	E		1st Floor, Storage Closet, Mastic Under Beige W/Brown Streaks				34.87	TRACE	CH	6.97	CH	6.97
	B	I	F											
20-05-084-25	C	198.4/6	G											
	D		H											
53	A	BR	E		1st Floor, Storage Closet, Mastic Under Beige W/Brown Streaks				38.69	TRACE	CH	NA		SAFP
	B	I	F											
20-05-084-26	C	198.6	G											
	D		H											
54	A	BE	E		1st Floor, Storage Closet, 12x12 Beige W/Brown Streaks				37.48	NAD		NAD		NAD
	B	I	F											
20-05-084-27	C	198.4/6	G											
	D		H											
55	A	BE	E		1st Floor, Storage Closet, 12x12 Beige W/Brown Streaks				36.99	NAD		NAD		NAD
	B	I	F											
20-05-084-28	C	198.4/6	G											
	D		H											
56	A	Y	E		1st Floor, Office Of Conference Room. Mastic Under White Tile W/Yellow Streaks				22.64	NAD		NAD		NAD
	B	I	F											
20-05-084-29	C	198.4/6	G											
	D		H											
57	A	WH	E		1st Floor, Office Of Conference Room, 12x12 White Tile W/Yellow Streaks				40.07	NAD		NAD		NAD
	B	I	F											
20-05-084-30	C	198.4/6	G											
	D		H											

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY **Project #:** 20-1125
Laboratory ID: 20-05-084	**Date of Report:** 05/20/20	**Date of Analysis:** 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results	% Asb	% PLM NOB Results	% TEM NOB Results	% TOTAL Asbestos
58	A	Y	E		1st Floor, Office Of Conference Room, Mastic Under White Tile W/Yellow Streaks			19.64	NAD	NAD	NAD
20-05-084-31	B	1	F								
	C	198.4/6	G								
	D		H								
59	A	WH	E		1st Floor, Office Of Conference Room, 12x12 White Tile W/Yellow Streaks			42.68	NAD	NAD	NAD
20-05-084-32	B	1	F								
	C	198.4/6	G								
	D		H								
64	A	BK	E		1st Floor, Library-Offices, Window Glazing Black			11.68	NAD	NAD	NAD
20-05-084-33	B	1	F								
	C	198.4/6	G								
	D		H								
65	A	BK	E		1st Floor, Library-Offices, Window Glazing Black			30.68	NAD	NAD	NAD
20-05-084-34	B	1	F								
	C	198.4/6	G								
	D		H								
66	A	BR	E		1st Floor, Addition Area, Glue Under Carpet			44.68	NAD	NAD	NAD
20-05-084-35	B	1	F								
	C	198.4/6	G								
	D		H								
67	A	BR	E		1st Floor, Addition Area, Glue Under Carpet			37.19	NAD	NAD	NAD
20-05-084-36	B	1	F								
	C	198.4/6	G								
	D		H								

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BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606	**Project:** 80 Franklin Avenue, Pearl River NY	**Project #:** 20-1125
Laboratory ID: 20-05-084	**Date of Report:** 05/20/20	**Date of Analysis:** 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% Aff	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
68	A	WH	E		1st Floor, Employee Entrance, 12x12 White Tile				3.51	NAD		NAD		NAD
	B	T	F											
20-05-084-37	C	198.4/6	G											
	D		H											
69	A	WH	E		1st Floor, Employee Entrance, 12x12 White Tile				2.36	NAD		NAD		NAD
	B	T	F											
20-05-084-38	C	198.4/6	G											
	D		H											
70	A	WH	E		1st Floor, Kitchen, Sink Undercoating-White				56.34	NAD		NAD		NAD
	B	T	F											
20-05-084-39	C	198.4/6	G											
	D		H											
71	A	WH	E		1st Floor, Kitchen, Sink Undercoating-White				17.18	NAD		NAD		NAD
	B	T	F											
20-05-084-40	C	198.4/6	G											
	D		H											

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BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY Project #: 20-1125
Laboratory ID: 20-05-084	**Date of Report:** 05/20/20	**Date of Analysis:** 05/19/20

PLM ANALYST	PLM-NOB ANALYST	TEM-NOB ANALYST	LABORATORY DIRECTOR
	D. Diallo	E. Loukianova	E. Dimitrakas

LABORATORY ACCREDITATION NUMBERS: NVLAP Lab Code 102958-0, NYSDOH ELAP Lab ID 10955

Samples will be stored for sixty (60) days. LTS Inc. should be notified within this time frame for a true duplicate analysis.

Above results relate only to samples submitted and analyzed. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government. Test reports may not be reproduced except in full and with prior approval of LTS Inc.

The liability of LTS Inc., with respect to the services charged, shall in no event exceed the amount of the invoice.

- Analytical Methodologies: EPA 600/R94-82-020 (Point Count only) and ELAP Mod(s)6. 198.1, 198.4, 198.6

NAD: No Asbestos Detected, NVA: No Visible Asbestos, SASP: Stopped at First Positive, CH: Chrysotile, AMOS: Amosite, TRE: Tremolite, ANTH: Anthophyllite, ACT: Actinolite, and CRO: Crocidolite

Stereomicroscopic Analysis: A: Color, B: Layers, C: Methodology, D: Cellulose, E: Fiberglass, F: Hair, G: Vermiculite, H: OTHER

- Color: BK: Black, BR: Brown, DKBR: Dark Brown, LTBR: Light Brown, RBR: Reddish Brown, GR: Gray, DK GR: Dark Gray, LT GR: Light Gray, BG: Beige, P: Pink, R: Red, T: Tan, WH: White, OFFWH: Off White, Y: Yellow, BL: Blue, CR: Cream, GN: Green, O: Orange, Multi: Multiple Colors

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BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY Project #: 20-1125
Laboratory ID: 20-05-065	**Date of Report:** 05/19/20	**Date of Analysis:** 05/18/20 - 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% ACE	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
1	A	GR	E	45	2nd Floor, Boiler Room, Fittings	45.00	NAD							NAD
20-05-085-01	B	1	F											
	C	198.1	G											
	D	10	H											
2	A	GR	E	35	2nd Floor, Boiler Room, Fittings	60.00	NAD							NAD
20-05-085-02	B	1	F											
	C	198.1	G											
	D	3	H											
3	A	GR	E	40	2nd Floor, Boiler Room, Fittings	57.00	NAD							NAD
20-05-085-03	B	1	F											
	C	198.1	G											
	D	3	H											
4	A	BR	E		2nd Floor, Boiler Room, CMU	100.00	NAD							NAD
20-05-085-04	B	1	F											
	C	198.1	G											
	D		H											
5	A	BR	E		1st Floor, Library Area, CMU	100.00	NAD							NAD
20-05-085-05	B	1	F											
	C	198.1	G											
	D		H											
6	A	BR	E		2nd Floor, Boiler Room, CMU Mortar	100.00	NAD							NAD
20-05-085-06	B	1	F											
	C	198.1	G											
	D		H											

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606	**Project:** 80 Franklin Avenue, Pearl River NY **Project #:** 20-1125
Laboratory ID: 20-05-085	**Date of Report:** 05/19/20 **Date of Analysis:** 05/18/20 - 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% Ash	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
7	A	BR	E		1st Floor, Library Area, CMU Mortar	100.00	NAD							NAD
	B	I	F											
20-05-085-07	C	198.3	G											
	D		H											
8	A	BR	E		2nd Floor, Boiler Room, CMU Mortar	100.00	NAD							NAD
	B	I	F											
20-05-085-08	C	198.1	G											
	D		H											
13	A	WH	E		2nd Floor, Boiler Room, Vibration Cloth-White				63.11	NAD		NAD		NAD
	B	I	F											
20-05-085-09	C	198.4/6	G											
	D		H											
14	A	WH	E		2nd Floor, Boiler Room, Vibration Cloth-White				67.84	NAD		NAD		NAD
	B	I	F											
20-05-085-10	C	198.4/6	G											
	D		H											
15	A	WH	E		2nd Floor, Boiler Room, Vibration Cloth-White				67.53	NAD		NAD		NAD
	B	I	F											
20-05-085-11	C	198.4/6	G											
	D		H											
16	A	GR	E		2nd Floor, Boiler Room, Concrete Slab	100.00	NAD							NAD
	B	I	F											
20-05-085-12	C	198.1	G											
	D		H											

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY Project #: 20-1125
Laboratory ID: 20-05-085	**Date of Report:** 05/29/20	**Date of Analysis:** 05/18/20 - 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results	% All	% PLM NOB Results	% TEM NOB Results	% TOTAL Asbestos
17	A	GR	E		1st Floor, Library Area, Concrete Slab	100.00	NAD				NAD
	B	1	F								
20-05-085-13	C	198.1	G								
	D		H								
20	A	GR/BR	E		2nd Floor, Boiler Room, Drywall	88.00	NAD				NAD
	B	2	F								
20-05-085-14	C	198.1	G								
	D	12	H								
31	A	GR/BR	E		1st Floor, Library Area-Offices, Drywall	92.00	NAD				NAD
	B	2	F								
20-05-085-15	C	198.1	G								
	D	8	H								
32	A	WH	E		.2nd Floor, Boiler Room, Joint Compound	100.00	NAD				NAD
	B	1	F								
20-05-085-16	C	198.1	G								
	D		H								
33	A	WH	E		1st Floor, Library Area-Offices, Joint Compound	100.00	NAD				NAD
	B	1	F								
20-05-085-17	C	198.1	G								
	D		H								
34	A	WH	E		1st Floor, Library Area, Joint Compound	100.00	NAD				NAD
	B	1	F								
20-05-085-18	C	198.1	G								
	D		H								

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY Project #: 20-1125
Laboratory ID: 20-05-085	**Date of Report:** 05/19/30	**Date of Analysis:** 05/18/20 - 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis					Sample Description	% Non-Fibrous Material	% Friable Results		% Aff	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
35	A	WH	E			1st Floor, Kitchen Area, Joint Compound	100.00	NAD							NAD
	B	1	F												
20-05-085-19	C	198.1	G												
	D		H												
36	A	WH	E			1st Floor, Conference Room, Joint Compound	100.00	NAD							NAD
	B	1	F												
20-05-085-20	C	198.1	G												
	D		H												
37	A	WH	E			1st Floor, Boiler Room, Door Insulation White	77.00	14.8	CH						23.00
	B	1	F					8.20	AMO						
20-05-085-21	C	198.1	G												
	D		H												
38	A		E			1st Floor, Boiler Room, Door Insulation White		NA							SAFP
	B		F												
20-05-085-22	C		G												
	D		H												
41	A	BK	E			1st Floor, Boiler Room, Boiler Unit Insulation Around Flue	100.00	NAD							NAD
	B	1	F												
20-05-085-23	C	198.1	G												
	D		H												
42	A	BK	E			1st Floor, Boiler Room, Boiler Unit Insulation Around Flue	100.00	NAD							NAD
	B	1	F												
20-05-085-24	C	198.1	G												
	D		H												

BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Hayler St., So. Hackensack, NJ 07606	Project: 80 Franklin Avenue, Pearl River NY	Project #: 20-1125
Laboratory ID: 20-05-085	Date of Report: 05/19/20	Date of Analysis: 05/18/20 - 05/19/20

Client ID # / Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
49	A	GR	E		1st Floor, Janitor Conference Room, Cementitious Material On Deck	100.00	NAD							NAD
	B	1	F											
20-05-085-25	C	198.1	G											
	D		H											
50	A	GR	E		1st Floor, Janitor Conference Room, Cementitious Material On Deck	100.00	NAD							NAD
	B	1	F											
20-05-085-26	C	198.1	G											
	D		H											
51	A	GR	E		1st Floor, Janitor Conference Room, Cementitious Material On Deck	100.00	NAD							NAD
	B	1	F											
20-05-085-27	C	198.1	G											
	D		H											
60	A	BR	E		1st Floor, Lobby, Floor Grout	100.00	NAD							NAD
	B	1	F											
20-05-085-28	C	198.1	G											
	D		H											
61	A	BR	E		1st Floor, Lobby, Floor Grout	100.00	NAD							NAD
	B	1	F											
20-05-085-29	C	198.1	G											
	D		H											
62	A	WH	E		1st Floor, Lobby, Wall Grout	100.00	NAD							NAD
	B	1	F											
20-05-085-30	C	198.1	G											
	D		H											

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BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY **Project #:** 20-1125
Laboratory ID: 20-05-085	**Date of Report:** 05/19/20	**Date of Analysis:** 05/18/20 - 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
63	A	WH	E		1st Floor, Ballroom Area, Wall Grout	100.00	NAD							NAD
	B	I	F											
20-05-085-31	C	198.1	G											
	D		H											

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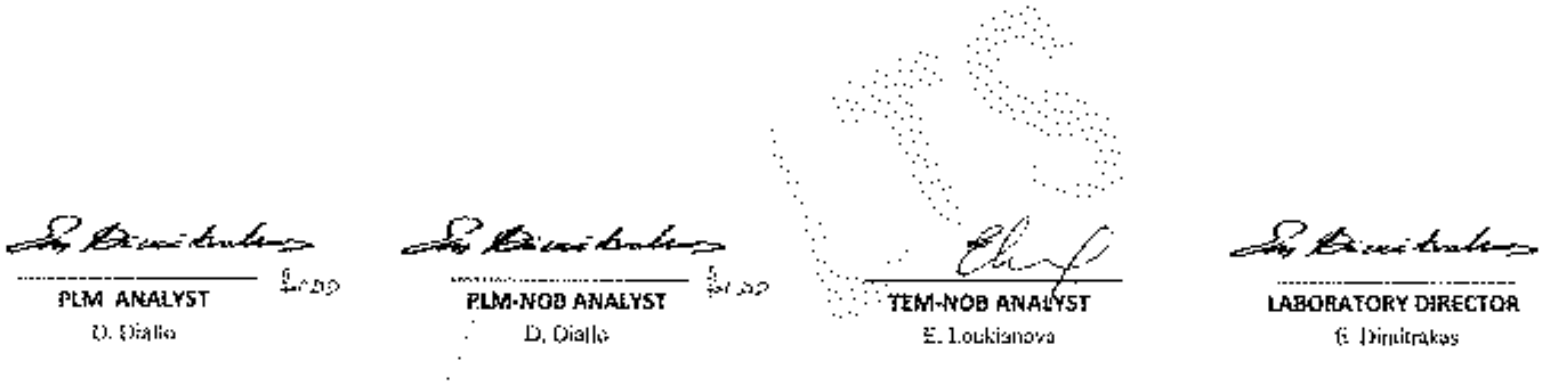
BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY **Project #:** 20-1125
Laboratory ID: 20-05-085	**Date of Report:** 05/19/20	**Date of Analysis:** 05/18/20 - 05/19/20



PLM ANALYST
D. Diallo

PLM-NOB ANALYST
D. Diallo

TEM-NOB ANALYST
E. Loukianova

LABORATORY DIRECTOR
G. Dimitrakas

LABORATORY ACCREDITATION NUMBERS: NVLAP Lab Code 101958-0, NYSDOH ELAP Lab ID 11955

Samples will be stored for sixty (60) days. LTS Inc. should be notified within this time frame for a new duplicate analysis.

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Analytical Methodologies: EPA 600/M4-82-020 (Point Count only) and ELAP Methods 198.1, 198.4, 198.6

NAD: No Asbestos Detected, NVD: No Visible Dust, SNP: Suspected Non-Friable, CH: Chrysotile, AMOS: Amosite, TRE: Tremolite, ANTH: Anthophyllite, ACT: Actinolite, and CRO: Crocidolite

Stereomicroscope Analysis: A: Loose, B: Layers, C: Matrix/Mastic, D: Cellulose, E: Fiberglass, F: Hair, G: Vermiculite H: OTHER

Color: BK: Black, BR: Brown, DK BR: Dark Brown, LI BR: Light Brown, R BR: Reddish Brown, GR: Gray, Dk GR: Dark Gray, Lt GR: Light Gray, BE: Beige, P: Pink, R: Red, T: Tan, WH: White, Off WH: Off White, Y: Yellow, BL: Blue, CR: Cream, GN: Green, O: Orange, Multi: Multiple Colors

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BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY **Project #:** 20-1125
Laboratory ID: 20-05-083	**Date of Report:** 05/20/20	**Date of Analysis:** 05/19/20

Client ID # / Lab ID #	Stereomicroscopic Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
72	A	BK	E		Roof, Elevation 1 Lowest, Roofing Material				20.83	NAD		NAD		NAD
	B	1	F											
20-05-083-01	C	198.4/6	G											
	D		H											
73	A	BK	E		Roof, Elevation 1 Lowest, Roofing Material				20.81	NAD		NAD		NAD
	B	1	F											
20-05-083-02	C	198.4/6	G											
	D		H											
74	A	WH	E		Roof, Elevation 1 Lowest, Flashing-White				24.67	NAD		NAD		NAD
	B	1	F											
20-05-083-03	C	198.4/6	G											
	D		H											
75	A	WH	E		Roof, Elevation 1 Lowest, Flashing-White				21.27	NAD		NAD		NAD
	B	1	F											
20-05-083-04	C	198.4/6	G											
	D		H											
76	A	WH	E		Roof, Elevation 1 Lowest, Caulking Above Metal Flashing				45.82	NAD		NAD		NAD
	B	1	F											
20-05-083-05	C	198.4/6	G											
	D		H											
77	A	WH	E		Roof, Elevation 2 Middle, Caulking Above Metal Flashing				21.90	NAD		NAD		NAD
	B	1	F											
20-05-083-06	C	198.4/6	G											
	D		H											

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BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler ST. So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY **Project #:** 20-1125
Laboratory ID: 20-05-083	**Date of Report:** 05/20/20	**Date of Analysis:** 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% Ash	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
78	A	BK	E		Roof, Elevation 2 Middle, Roofing Material				25.50	NAD		NAD		NAD
	B	T	F											
20-05-083-07	C	198.4/6	G											
	D		H											
79	A	BK	E		Roof, Elevation 2 Middle, Roofing Material				20.92	NAD		NAD		NAD
	B	T	F											
20-05-083-08	C	198.4/6	G											
	D		H											
80	A	WH	E		Roof, Elevation 2 Middle, Flashing-White				19.31	NAD		NAD		NAD
	B	T	F											
20-05-083-09	C	198.4/6	G											
	D		H											
81	A	WH	E		Roof, Elevation 2 Middle, Flashing-White				25.72	NAD		NAD		NAD
	B	T	F											
20-05-083-10	C	198.4/6	G											
	D		H											
82	A	BK	E		Roof, Elevation 3 Top, Roofing Material				21.15	NAD		NAD		NAD
	B	T	F											
20-05-083-11	C	198.4/6	G											
	D		H											
83	A	BK	E		Roof, Elevation 3 Top, Roofing Material				20.43	NAD		NAD		NAD
	B	T	F											
20-05-083-12	C	198.4/6	G											
	D		H											

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BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 80 Franklin Avenue, Pearl River NY Project #: 20-1125
Laboratory ID: 20-05-083	**Date of Report:** 05/20/20	**Date of Analysis:** 05/19/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
84	A	WH	E		Roof, Elevation 3 Top, Flashing-White				25.87	NAD		NAD		NAD
	B	1	F											
20-05-083-13	C	198.4/6	G											
	D		H											
85	A	WH	E		Roof, Elevation 3 Top, Flashing-White				37.26	NAD		NAD		NAD
	B	1	F											
20-05-083-14	C	198.4/6	G											
	D		H											
86	A	BK	E		Roof, Elevation 3 Top, Skylight Window Caulk				25.86	NAD		NAD		NAD
	B	1	F											
20-05-083-15	C	198.4/6	G											
	D		H											
87	A	BK	E		Roof, Elevation 3 Top, Skylight Window Caulk				31.00	NAD		NAD		NAD
	B	1	F											
20-05-083-16	C	198.4/6	G											
	D		H											

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BULK ASBESTOS TEST REPORT

Client/Address: Omega Environmental/280 Huyler St., So. Hackensack, NJ 07606		**Project:** 86 Franklin Avenue, Pearl River NY **Project #:** 20-1125
Laboratory ID: 20-05-083	**Date of Report:** 05/20/20	**Date of Analysis:** 05/19/20

PLM ANALYST	PLM-NOB ANALYST	TEM-NOB ANALYST	LABORATORY DIRECTOR
	O. Ostlo	E. Loukianova	E. Dimitrakos

LABORATORY ACCREDITATION NUMBERS: NVLAP Lab Code 101956-0, NYSDOH ELAP Lab ID 10955

Samples will be stored for sixty (60) days. LTS Inc. should be notified within this time frame for a true duplicate analysis.

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The liability of LTS Inc., with respect to the services charged, shall in no event exceed the amount of the invoice.

Analytical Methodologies: EPA 600/R-93-116 (Point Count only) and ELAP Methods 198.1, 198.4, 198.6.

NAD: No Asbestos Detected, NVD: No Vermiculite Detected, SATP: Suspected Fiber Positive, CH: Chrysotile, AMOS: Amosite, TRE: Tremolite, ANTH: Anthophyllite, ACT: Actinolite, and CRO: Crocidolite

Stereomicroscopic Analysis: A: Color, B: Layers, C: Matrix/Binder, D: Cellulose, E: Fiberglass, F: Hair, G: Vermiculite, H: OTHER

Color: BK: Black, BR: Brown, DB: HR: Dark Brown, LB BR: Light Brown, R HR: Reddish Brown, GR: Gray, DK GR: Dark Gray, LT GR: Light Gray, BE: Beige, P: Pink, R: Red, T: Tan, WH: White, OTWH: Off White, Y: Yellow, BL: Blue, CR: Cream, GN: Green, O: Orange, MOL: Multiple Colors

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20-05-084

Page 1 of 4

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and edaym@omega-env.com

Project Name	Pearl River Public Library
Project No.	20-1125
Site Address	80 Franklin Ave Pearl River Ny 10965
Sampled By	Eddy Mendoza 13-12147 / 153221 Alberto Fajardo
Date Sampled	5/13/2020

Turnaround Time Requested:	24 HR TAT
Total # of Samples:	1 - 71 of 71
[illegible]	Y
[illegible]	
[illegible]	Y

Sample ID	Lab ID #	Floor/Level	Location (Room/Area/etc)	[illegible]	[illegible]	Condition	Quantity	[illegible]	Analysis Requested				ADD PLM TEM Notes and Comments
1		2nd Floor	Boiler Room	1	Fittings	Damaged	70 LnFt	1	X				
2				1	Fittings			1	x				
3				1	Fittings			1	X				
4				2	CMU	NVD	TBD	1	x				
5		1st Floor	Library Area	2	CMU	NVD	TBD	1	x				
6		2nd Floor	Boiler Room	3	CMU Mortar	NVD	TBD	1	x				
7		1st Floor	Library Area	3	CMU Mortar	NVD	TBD	1	x				
8		2nd Floor	Boiler Room	3	CMU Mortar	NVD	TBD	1	x				
9	1			4	Duct Caulking on seams - Beige	NVD		1		x	x		(-) NAD (-) NAD
10	2			4	Duct Caulking on seams - Beige	NVD		1		x	x		
11	3			5	Duct Caulking on joints - Gold	NVD		1		x	x		(-) NAD (-) NAD
12	4	1st Floor	Library Area	5	Duct Caulking on joints - Gold	NVD		1		x	x		
13		2nd Floor	Boiler Room	6	Vibration cloth - White	NVD		1	x				
14				6	Vibration cloth - White	NVD		1	x				
15				6	Vibration cloth - White	NVD		1	x				
16				7	concrete slab	NVD		1	x				
17		1st Floor	Library Area	7	concrete slab	NVD		1	x				
18	5	2nd Floor	Boiler Room	8	Interior window glazing	NVD		1		x	x		(-) NAD (-) NAD

Relinquished By & Company:	Eddy Mendoza [signature]	Omega Environmental
Date & Time:	5/13/20	16:00PM

Received By & Company:	[illegible]	[illegible]
Date & Time:	5/13/20	[illegible]
Analyzed By:	E. [illegible]	
Date & Time:	5.13.20	

31 PLM 40 PLM/TEM NOB

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20-05-084

Project # 20-1125
page 2 of 4

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

Sample #	Lab ID #	Floor/Level	Location (Room/Area/etc)	[illegible]	[illegible]	[illegible]	Quantity	[illegible]	Analysis Requested				Notes and Comments (PLM NOB TEM)
19	6	1st floor	Library Area - Offices	8	interior window glazing	NVD	TBD	1	•	•	•	•	(−) NAD (−) NAD
20	7	2nd floor	Boiler Room	9	Hvac Unit Bedding caulk - black	↓	TBD	1	•	•	•	•	(−) NAD (−) NAD
21	8	↓	↓	9	Hvac Unit Bedding caulk - black		TBD	1	•	•	•	•	↓ ↓
22	9			10	Red Gasket		TBD	1	•	•	•	•	(−) NAD (−) NAD
23	10			10	Red Gasket		TBD	1	•	•	•	•	↓ ↓
24	11			11	Green Gasket		TBD	1	•	•	•	•	(−) NAD (−) NAD
25	12			11	Green Gasket		TBD	1	•	•	•	•	↓ ↓
26	13			12	Gray duct sealant on duct joints		TBD	1	•	•	•	•	(−) NAD (−) NAD
27	14	1st Floor	Bathroom Area	12	Gray duct sealant on duct joints		TBD	1	•	•	•	•	↓ ↓
28	15	2nd floor	Boiler Room	13	Mastic On CMU		20 SF	1	•	•	•	•	(−) NAD (−) NAD
29	16	↓	↓	13	Mastic On CMU		20 SF	1	•	•	•	•	↓ ↓
30				14	Drywall		TBD	1	•	•	•	•	
31		1st floor	Library Area - Offices	14	Drywall		TBD	1	•	•	•	•	
32		2nd floor	Boiler Room	15	Joint Compound		TBD	1	•	•	•	•	
33		1st floor	Library Area - Offices	15	Joint Compound		TBD	1	•	•	•	•	
34		↓	Library Area	15	Joint Compound		TBD	1	•	•	•	•	
35			Kitchen Area	15	Joint Compound		TBD	1	•	•	•	•	
36			Conference room	15	Joint Compound		TBD	1	•	•	•	•	
37		1st floor	boiler room	16	door insulation white		24 SF	1	•	•	•	•	
38		1st floor	Boiler Room	16	door insulation white		24 SF	1	•	•	•	•	
39	17	↓	↓	17	Black mastic on floor		TBD	1	•	•	•	•	(−) NAD (+) 3.61% CH
40	18	↓	Back Janitor Hall	17	Black mastic on floor	↓	↓	1	•	•	•	•	↓ NA

Relinquished By & Company:	Eddy Montoya [signature]	Omega Environmental
Date & Time:	5/13/20	16:00PM

Received By Company:	D. Dimino	
Date & Time:	5/13/20	6:30
Analyzed By:	E. Laukanova	ELP
Date & Time:	5/14/20	

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20-05-084

Project #: 20-1125
page 3 of 4

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc.)	HA #	[illegible]	General Condition	Quantity	[illegible]	Analysis Requested: [illegible]	[illegible]	[illegible]	[illegible]	PLM NOB TEM Notes and Comments
41		1st floor	boiler room	18	Boiler unit insulation around flute	Damaged	6 SF	1	•	•	•	•	
42		↓		18	Boiler unit insulation around flute	Damaged	6 SF	1	•	•	•	•	
43	19		Janitor Conference room	19	glue under carpet	NVD	TBD	2 of 2	•	•	•	•	(−) NAD (−) TR. CH
44	20		↓	19	glue under carpet	NVD	TBD	2 of 2	•	•	•	•	↓ ↓
45	21			20	2x2 ceiling tile Bumpy popcorn	NVD	TBD	1	•	•	•	•	(−) NAD (−) NAD
46	22		Library Area	20	2x2 ceiling tile Bumpy popcorn	NVD	TBD	1	•	•	•	•	↓ ↓
47	23		Addition Area	21	2x2 ceiling tile pinholes	NVD	TBD	1	•	•	•	•	(−) NAD (−) NAD
48	24		Conference Room	21	2x2 ceiling tile pinholes	NVD	TBD	1	•	•	•	•	↓ ↓
49			Janitor Conference room	22	cemetitious material on deck	NVD	TBD	1	•	•	•	•	
50			Janitor Conference room	22	cemetitious material on deck	NVD	TBD	1	•	•	•	•	
51			Janitor Conference room	22	cemetitious material on deck	NVD	TBD	1	•	•	•	•	
52	25		Stoarge Closet	23	mastic under beige w/brown streaks	NVD	TBD	2 of 2	•	•	•	•	(−) TR CH (+) 6.97/CH
53	26		Stoarge Closet	23	mastic under beige w/brown streaks	NVD	TBD	2 of 2	•	•	•	•	↓ NA
54	27		Stoarge Closet	24	12x12 beige w/brown streaks	NVD	TBD	1 of 2	•	•	•	•	(−) NAD (−) NAD
55	28		Stoarge Closet	24	12x12 beige w/brown streaks	NVD	TBD	1 of 2	•	•	•	•	↓ ↓
56	29		Office Of Conference room	25	mastic under white tile w/yellow streaks	NVD	TBD	2 of 2	•	•	•	•	(−) NAD (−) NAD
57	30		Office Of Conference room	26	12x12 white tile w/yellow streaks	NVD	TBD	1 of 2	•	•	•	•	↓ ↓
58	31		Office Of Conference room	25	mastic under white tile w/yellow streaks	NVD	TBD	2 of 2	•	•	•	•	(−) NAD (−) NAD
59	32		Office Of Conference room	26	12x12 white tile w/yellow streaks	NVD	TBD	1 of 2	•	•	•	•	↓ ↓
60			Lobby	27	Floor Grout	NVD	TBD	1	•	•	•	•	
61			Lobby	27	Floor Grout	NVD	TBD	1	•	•	•	•	
62		↓	Lobby	28	wall grout	NVD	TBD	1	•	•	•	•	

Relinquished By & Company:	Eddy Montoya [signature]	Omega Environmental	Received by Company: [illegible]
Date & Time:	5/13/20	16:00PM	Date & Time: 5/13/20 10:30
			Analyzed By: F. [illegible]
			Date & Time: 5/19/20

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20-05-084

Project #: 20-1125
page 4 of 4

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

Sample #	Lab ID #	Floor/Level	Location (Room/Area, etc)	HA #	Description of Homogeneous Material	General Condition	Quantity	[illegible]	Analysis Requested [illegible]	[illegible]	[illegible]	[illegible]	PLM NOB TEM Notes and Comments
63		1st floor	Bathroom Area	28	wall grout	NVD	TBD	1					
64	33	1st floor	Library - Offices	29	window glazing black	NVD	TBD	1					(-) NAD (-) NAD
65	34	↓	Library - Offices	29	window glazing black	NVD	TBD	1					↓ ↓
66	35		addition area	30	glue under carpet	NVD	TBD	2 of 2					(-) NAD (-) NAD
67	36		addition area	30	glue under carpet	NVD	TBD	2 of 2					↓ ↓
68	37		Employee Entrance	31	12x12 white tile	NVD	TBD	2 of 2					(-) NAD (-) NAD
69	38		Employee Entrance	31	12x12 white tile	NVD	TBD	2 of 2					↓ ↓
70	39		Kitchen	32	sink undercoating - white	NVD	4sf	1					(-) NAD (-) NAD
71	40	↓	Kitchen	32	sink undercoating - white	NVD	4sf	1					↓ ↓

Relinquished By & Company:	Eddy Montoya [signature]		Omega Environmental
Date & Time:	5/13/20		16:00PM

Received By Company:	[illegible]
Date & Time:	5/13/20 [illegible]
Analyzed By:	[illegible]
Date & Time:	5/19/20

![OMEGA logo]

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2005-085

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com and eadem@omega-env.com

Project Name:	Pearl River Public Library
Project #:	20-1125
Site Location:	80 Franklin Ave Pearl River Ny 10965
Sampled By:	Eddy Montoya 13-12147 / 159271 Alberto Fajardo
Date Sampled:	5/13/2020

Turnaround Time Requested:	24 HR TAT
Total # of Samples:	1 - 71 of 71
[illegible]	√
[illegible]	
[illegible]	√

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc.)	HA #	Description of Suspect Material	General Condition	Quantity		Analysis Requested				Notes and Comments (PLM PLM NOB TEM)
1	1	2nd Floor	Boiler Room	1	Fittings	Damaged	10 Ln Ft	1	X			(-)	NAD
2	2	↓	↓	1	Fittings	↓	↓	1	X			↓	
3	3			1	Fittings			1	X			↓	
4	4	↓	↓	2	CMU	NVD	TBD	1	X			(-)	NAD
5	5	1st Floor	Library Area	2	CMU	NVD	TBD	1	X			↓	
6	6	2nd Floor	Boiler Room	3	CMU Mortar	NVD	TBD	1	X			(-)	NAD
7	7	1st Floor	Library Area	3	CMU Mortar	NVD	TBD	1	X			↓	
8	8	2nd Floor	Boiler Room	3	CMU Mortar	NVD	TBD	1	X			↓	
9		↓	↓	4	Duct Caulking on seams - Beige	NVD	↓	1		x	x		
10				4	Duct Caulking on seams - Beige	NVD		1		x	x		
11		↓	↓	5	Duct Caulking on joints - Gold	NVD		1		x	x		
12		1st Floor	Library Area	5	Duct Caulking on joints - Gold	NVD		1		x	x		
13	9	2nd Floor	Boiler Room	6	Vibration cloth - White	NVD		1	x	✓			(-) NAD (-) NAD
14	10	↓	↓	6	Vibration cloth - White	NVD		1	x	✓			↓ ↓
15	11			6	Vibration cloth - White	NVD		1	x	✓			
16	12	↓	↓	7	concrete slab	NVD		1	x			(-)	NAD
17	13	1st Floor	Library Area	7	concrete slab	NVD		1	x			↓	
18		2nd Floor	Boiler Room	8	Interior window glazing	NVD	↓	1		x	x		

Relinquished By & Company:	Eddy Montoya [signature]	Omega Environmental	
Date & Time:	5/13/20	16:00PM	

Received By/Company:	[illegible]
Date & Time:	5/13/20 10:30
Analyzed By:	E. [illegible]
Date & Time:	[illegible] 19:00

31 Plm 40 Plm/TEM NOB.

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20-05-085

Project #: 20-1125
page 2 of 4

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc.)	HA #	Description of Homogeneous Material	General Condition	Quantity	Layers	Analysis Requested: PLM	NOB	TEM	Other	Notes and Comments
19		1st floor	Library Area - Offices	8	Interior window glazing	NVD	TBD	1	•	•	•	•	
20		2nd floor	Boiler Room	9	Hvac Unit Bedding caulk - black	↓	TBD	1	•	•	•	•	
21		↓	↓	9	Hvac Unit Bedding caulk - black	↓	TBD	1	•	•	•	•	
22		↓	↓	10	Red Gasket	↓	TBD	1	•	•	•	•	
23		↓	↓	10	Red Gasket	↓	TBD	1	•	•	•	•	
24		↓	↓	11	Green Gasket	↓	TBD	1	•	•	•	•	
25		↓	↓	11	Green Gasket	↓	TBD	1	•	•	•	•	
26		↓	↓	12	Gray duct sealant on duct joints	↓	TBD	1	•	•	•	•	
27		1st Floor	Bathroom Area	12	Gray duct sealant on duct joints	↓	TBD	1	•	•	•	•	
28		2nd floor	Boiler Room	13	Mastic On CMU	↓	20 SF	1	•	•	•	•	
29		↓	↓	13	Mastic On CMU	↓	20 SF	1	•	•	•	•	
30	14	↓	↓	14	Drywall	↓	TBD	1	•	•	•	•	(−) NAD
31	15	1st floor	Library Area - Offices	14	Drywall	↓	TBD	1	•	•	•	•	↓
32	16	2nd floor	Boiler Room	15	Joint Compound	↓	TBD	1	•	•	•	•	(−) NAD
33	17	1st floor	Library Area - Offices	15	Joint Compound	↓	TBD	1	•	•	•	•	↓
34	18	↓	Library Area	15	Joint Compound	↓	TBD	1	•	•	•	•	↓
35	19	↓	Kitchen Area	15	Joint Compound	↓	TBD	1	•	•	•	•	↓
36	20	↓	Conference room	15	Joint Compound	↓	TBD	1	•	•	•	•	↓
37	21	1st floor	boiler room	16	door insulation white	↓	24 SF	1	•	•	•	•	(+) (4.8/CH, 8.2) AMO
38	22	1st floor	Boiler Room	16	door insulation white	↓	24 SF	1	•	•	•	•	NA
39		↓	↓	17	Black mastic on floor	↓	TBD	1	•	•	•	•	
40		↓	Back Janitor Hall	17	Black mastic on floor	↓	↓	1	•	•	•	•	

Relinquished By & Company:	Eddy Montoya	[signature]	Omega Environmental
Date & Time:	5/13/20		16:00PM

Received By/Company:	D. [illegible]	[illegible]
Date & Time:	5/15/20	[illegible]
Analyzed By:	E. [illegible]	
Date & Time:	[illegible] 5.19.20	

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20-05-085

Project #: 20-1125
page 3 of 4

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

Sample #	Lab ID#	Floor/Level	Location (Room, Area, etc)	HA#	Description	General Condition	Quantity	[illegible]	Analysis Requested				Notes and Comments
									[illegible]	[illegible]	[illegible]	[illegible]	
41	23	1st floor	boiler room	18	Boiler unit insulation around flute	Damaged	5 SF	1	•	•	•	•	(-) NAD
42	24	↓		18	Boiler unit insulation around flute	Damaged	6 SF	1	•	•	•	•	↓
43			Janitor Conference room	19	glue under carpet	NVD	TBD	2 of 2	•	•	•	•	
44			↓	19	glue under carpet	NVD	TBD	2 of 2	•	•	•	•	
45				20	2x2 ceiling tile Bumpy popcorn	NVD	TBD	1	•	•	•	•	
46			Library Area	20	2x2 ceiling tile Bumpy popcorn	NVD	TBD	1	•	•	•	•	
47			Addition Area	21	2x2 ceiling tile pinholes	NVD	TBD	1	•	•	•	•	
48			Conference Room	21	2x2 ceiling tile pinholes	NVD	TBD	1	•	•	•	•	
49	25		Janitor Conference room	22	cemetitious material on deck	NVD	TBD	1	•	•	•	•	(-) NAD
50	26		Janitor Conference room	22	cemetitious material on deck	NVD	TBD	1	•	•	•	•	
51	27		Janitor Conference room	22	cemetitious material on deck	NVD	TBD	1	•	•	•	•	↓
52			Stoarge Closet	23	mastic under beige w/brown streaks	NVD	TBD	2 of 2	•	•	•	•	
53			Stoarge Closet	23	mastic under beige w/brown streaks	NVD	TBD	2 of 2	•	•	•	•	
54			Stoarge Closet	24	12x12 beige w/brown streaks	NVD	TBD	1 of 2	•	•	•	•	
55			Stoarge Closet	24	12x12 beige w/brown streaks	NVD	TBD	1 of 2	•	•	•	•	
56			Office Of Conference room	25	mastic under white tile w/yellow streaks	NVD	TBD	2 of 2	•	•	•	•	
57			Office Of Conference room	26	12x12 white tile w/yellow streaks	NVD	TBD	1 of 2	•	•	•	•	
58			Office Of Conference room	25	mastic under white tile w/yellow streaks	NVD	TBD	2 of 2	•	•	•	•	
59			Office Of Conference room	26	12x12 white tile w/yellow streaks	NVD	TBD	1 of 2	•	•	•	•	
60	28		Lobby	27	Floor Grout	NVD	TBD	1	•	•	•	•	(-) NAD
61	29		Lobby	27	Floor Grout	NVD	TBD	1	•	•	•	•	↓
62	30	↓	Lobby	28	wall grout	NVD	TBD	1	•	•	•	•	(-) NAD

Relinquished By & Company:	Eddy Montoya [signature]	Omega Environmental
Date & Time:	5/13/20	16:00PM

Received By & Company:	[illegible]
Date & Time:	5/13/20 10:30
Analyzed By:	E. [illegible]
Date & Time:	5/19/20

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20-05-085

Project #: 20-1125
page 4 of 4

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

Sample #	Task ID	Floor/Level	Location (Room, Area, etc.)	HA	Description of Homogeneous Material (Type, Color, etc.)	General Condition	Quantity	[illegible]	Analysis Requested				Notes and Comments
63	24	1st floor	Bathroom Area	28	wall grout	NVD	TBD	1					(-) NAD
64		1st floor	Library - Offices	29	window glazing black	NVD	TBD	1					
65		↓	Library - Offices	29	window glazing black	NVD	TBD	1					
66			addition area	30	glue under carpet	NVD	TBD	2 of 2					
67			addition area	30	glue under carpet	NVD	TBD	2 of 2					
68			Employee Entrance	31	12x12 white tile	NVD	TBD	2 of 2					
69			Employee Entrance	31	12x12 white tile	NVD	TBD	2 of 2					
70			Kitchen	32	sink undercoating - white	NVD	4sf	1					
71			Kitchen	32	sink undercoating - white	NVD	4sf	1					

Relinquished By & Company:	Eddy Montoya	[signature]	Omega Environmental
Date & Time:	5/13/20		16:00PM

Received By/Company:	D. [illegible]	[illegible]
Date & Time:	5/15/20	[illegible]
Analyzed By:	[illegible]	
Date & Time:	[illegible]	

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page 5 of 5

CHAIN OF CUSTODY/ANALYSIS REQUEST FOR ASBESTOS BULK SAMPLES

email results to: lab@omega-env.com **and** eddym@omega-env.com

Project Name:	Pearl River Public Library
Project #:	20-1125
Site Location:	80 Franklin Ave Pearl River NY 10965
Sampled By:	Eddy Montoya 13-12147 / 153275
Date Sampled:	5/14/2020

Turnaround Time Requested:	24-48 TAT
Total # of Samples: 16 Samples	72 - 87 of 87
Analyze by each individual layer as indicated	V
Analyze all samples without stop positive stop	
[illegible]	V

Sample #	Lab ID #	Floor/Level	Location (Room, Area, etc)	HA#	[illegible]	Condition	Quantity	[illegible]	Analysis Requested [illegible]	[illegible]	[illegible]	[illegible]	NOB PLM	TEM Notes and Comments
72	1	Roof	Elevation 1 Lowest	33	Roofing Material	NVD	TBD	1		X	x		(–) NAD ↓	(–) NAD ↓
73	2	Roof	Elevation 1 Lowest	33	Roofing Material	NVD	TBD	1		x	x			
74	3	Roof	Elevation 1 Lowest	34	Flashing - White	NVD	TBD	2 of 2		X	x		(–) NAD ↓	(–) NAD ↓
75	4	Roof	Elevation 1 Lowest	34	Flashing - White	NVD	TBD	2 of 2		x	x			
76	5	Roof	Elevation 1 Lowest	35	Caulking Above Metal Flashing	NVD	TBD	1		x	x		(–) NAD ↓	(–) NAD ↓
77	6	Roof	Elevation 2 Middle	35	Caulking Above Metal Flashing	NVD	TBD	1		x	x			
78	7	Roof	Elevation 2 Middle	36	Roofing Material	NVD	TBD	1		x	x		(–) NAD ↓	(–) NAD ↓
79	8	Roof	Elevation 2 Middle	36	Roofing Material	NVD	TBD	1		x	x			
80	9	Roof	Elevation 2 Middle	37	Flashing - White	NVD	TBD	2 of 2		x	x		(–) NAD ↓	(–) NAD ↓
81	10	Roof	Elevation 2 Middle	37	Flashing - White	NVD	TBD	2 of 2		x	x			
82	11	Roof	Elevation 3 Top	38	Roofing Material	NVD	TBD	1		x	x		(–) NAD ↓	(–) NAD ↓
83	12	Roof	Elevation 3 Top	38	Roofing Material	NVD	TBD	1		x	x			
84	13	Roof	Elevation 3 Top	39	Flashing - White	NVD	TBD	2 of 2		x	x		(–) NAD ↓	(–) NAD ↓
85	14	Roof	Elevation 3 Top	39	Flashing - White	NVD	TBD	2 of 2		x	x			
86	15	Roof	Elevation 3 Top	40	Skylight window caulk	NVD	TBD	1		x	x		(–) NAD ↓	(–) NAD ↓
87	16	Roof	Elevation 3 Top	40	Skylight window caulk	NVD	TBD	1		x	x			

Relinquished By & Company:	Eddy Montoya [signature]	Omega Environmental	
Date & Time:	5/14/20	13:00PM	

Received By Company:	D. D[illegible]
Date & Time:	5/18/20 [illegible]
Analyzed By:	E. [illegible]
Date & Time:	5/19/20

16 TEM/PLM NOB

XRF

B1. Laboratory Analytical Reports

Company	Heuresis Corp.
Model	Pb200i
Type	Lead Paint Analyzer
Serial Num.	2370
App Version	Pb200i-4.1-11

Job Id	Reading #	Units	Time	LOCATION	Room Equivalent	Wall (side)	Component	Substrate	Color	Paint Condition	Result	Concentration	Notes
20-1125	1	mg/cm2	5/14/2020 08:59:55			Celibration						1	
20-1125	2	mg/cm2	5/14/2020 09:00:10			Celibration						0.9	
20-1125	3	mg/cm2	5/14/2020 09:00:24			Celibration						1	
20-1125	4	mg/cm2	5/14/2020 09:00:41			Celibration						0.1	
20-1125	5	mg/cm2	5/14/2020 09:01:01			Celibration						-0.1	
20-1125	6	mg/cm2	5/14/2020 09:01:10			Celibration						0.1	
20-1125	7	mg/cm2	5/14/2020 09:12:56	Pearl River Library	Staff Breakroom	A	Wall	Drywall	Beige	Intact	Negative	0.1	
20-1125	8	mg/cm2	5/14/2020 09:13:20	Pearl River Library	Staff Breakroom	D	Wall	Drywall	Beige	Intact	Negative	0.1	
20-1125	9	mg/cm2	5/14/2020 09:14:06	Pearl River Library	Staff Breakroom	D	Baseboard	Wood	Brown	Intact	Negative	-0.2	
20-1125	10	mg/cm2	5/14/2020 09:15:46	Pearl River Library	Staff Breakroom	B	Window Frame	Wood	White	Intact	Negative	-0.2	
20-1125	11	mg/cm2	5/14/2020 09:19:46	Pearl River Library	Administrative Offices	A	Door Buck	Metal	Pink	Intact	Negative	0.1	
20-1125	12	mg/cm2	5/14/2020 09:21:38	Pearl River Library	Director's Office	A	Door Buck	Metal	White	Intact	Negative	0.1	
20-1125	13	mg/cm2	5/14/2020 09:22:07	Pearl River Library	Director's Office	B	Baseboard	Wood	White	Intact	Negative	-0.1	
20-1125	14	mg/cm2	5/14/2020 09:23:26	Pearl River Library	Director's Office	B	Wall	Drywall	Light Blue	Intact	Negative	0.1	
20-1125	15	mg/cm2	5/14/2020 09:24:01	Pearl River Library	Director's Office	C	Wall	Drywall	Blue	Intact	Negative	0.1	
20-1125	16	mg/cm2	5/14/2020 09:28:46	Pearl River Library	Children's Room	Ceiling	Vent	Metal	Tan	Intact	Negative	-0.1	
20-1125	17	mg/cm2	5/14/2020 09:29:51	Pearl River Library	Children's Room	C	Window Case	Wood	White	Intact	Negative	0	
20-1125	18	mg/cm2	5/14/2020 09:30:54	Pearl River Library	Children's Room	A	Wall	Drywall	Tan	Intact	Negative	0	
20-1125	19	mg/cm2	5/14/2020 09:31:35	Pearl River Library	Children's Room	C	Baseboard	Wood	Brown	Intact	Negative	0	
20-1125	20	mg/cm2	5/14/2020 09:34:10	Pearl River Library	Toddler Room	C	Baseboard	Wood	Blue	Intact	Negative	-0.1	
20-1125	21	mg/cm2	5/14/2020 09:34:44	Pearl River Library	Toddler Room	B	Baseboard	Wood	Grey	Intact	Negative	0	
20-1125	22	mg/cm2	5/14/2020 09:35:22	Pearl River Library	Toddler Room	B	Wall	Drywall	Blue	Intact	Negative	0.1	
20-1125	23	mg/cm2	5/14/2020 09:35:42	Pearl River Library	Toddler Room	C	Wall	Drywall	Black	Intact	Negative	0	
20-1125	24	mg/cm2	5/14/2020 09:37:09	Pearl River Library	Toddler Room	C	Door Casing	Metal	Blue	Intact	Negative	0.1	
20-1125	25	mg/cm2	5/14/2020 09:40:48	Pearl River Library	Coat Room	C	Wall	Drywall	Blue	Intact	Negative	0.1	
20-1125	26	mg/cm2	5/14/2020 09:42:02	Pearl River Library	Coat Room	A	Wall	Drywall	Tan	Intact	Negative	0.1	
20-1125	27	mg/cm2	5/14/2020 09:42:48	Pearl River Library	Coat Room	C	Electricial Panel Frame	Metal	Tan	Intact	Negative	0	
20-1125	28	mg/cm2	5/14/2020 09:46:06	Pearl River Library	Unisex Bathroom	A	Wall	Drywall	Light-Blue	Intact	Negative	0.1	
20-1125	29	mg/cm2	5/14/2020 09:49:29	Pearl River Library	Staff Work Space	C	Wall	Drywall	Tan	Intact	Negative	0.1	
20-1125	30	mg/cm2	5/14/2020 09:49:53	Pearl River Library	Staff Work Space	C	Baseboard	Wood	Tan	Intact	Negative	0	
20-1125	31	mg/cm2	5/14/2020 09:50:38	Pearl River Library	Staff Work Space	C	Door Casing	Metal	Pink	Intact	Negative	0.1	
20-1125	32	mg/cm2	5/14/2020 09:59:31	Pearl River Library	Mechanical Room	Center	Stair Railing	Metal	Grey	Deteriorated	Negative	0.2	
20-1125	33	mg/cm2	5/14/2020 10:00:05	Pearl River Library	Mechanical Room	Center	Stair Risers	Metal	Grey	Deteriorated	Negative	0.1	
20-1125	34	mg/cm2	5/14/2020 10:00:35	Pearl River Library	Mechanical Room	Center	Stair Stringer	Metal	Grey	Intact	Negative	0.2	
20-1125	35	mg/cm2	5/14/2020 10:01:08	Pearl River Library	Mechanical Room	Center	Stair Railing	Metal	Tan	Deteriorated	Negative	0.1	
20-1125	36	mg/cm2	5/14/2020 10:03:11	Pearl River Library	Mechanical Room	Center	Door Frame	Metal	Grey	Deteriorated	Negative	0.1	
20-1125	37	mg/cm2	5/14/2020 10:03:49	Pearl River Library	Mechanical Room	Center	Door	Metal	Off-White	Intact	Negative	0	
20-1125	38	mg/cm2	5/14/2020 10:07:20	Pearl River Library	Conference Room	A	Door Frame	Metal	White	Intact	Negative	0.1	
20-1125	39	mg/cm2	5/14/2020 10:08:00	Pearl River Library	Conference Room	A	Wall	Drywall	Light Blue	Intact	Negative	0.1	
20-1125	40	mg/cm2	5/14/2020 10:08:27	Pearl River Library	Conference Room	A	Baseboard	Wood	White	Intact	Negative	0.1	
20-1125	41	mg/cm2	5/14/2020 10:11:00	Pearl River Library	Story Time Room	A	Baseboard	Wood	Blue	Intact	Negative	0	
20-1125	42	mg/cm2	5/14/2020 10:11:37	Pearl River Library	Story Time Room	A	Wall	Drywall	Yellow	Intact	Negative	0.1	
20-1125	43	mg/cm2	5/14/2020 10:12:04	Pearl River Library	Story Time Room	B	Wall	Drywall	Blue	Intact	Negative	0	
20-1125	44	mg/cm2	5/14/2020 10:12:27	Pearl River Library	Story Time Room	C	Wall	Drywall	Red	Intact	Negative	0.1	

20-1125	45	mg/cm2	5/14/2020 10:12:58	Pearl River Library	Story Time Room	D	Wall	Drywall	Tan	Intact	Negative	0	
20-1125	46	mg/cm2	5/14/2020 10:15:31	Pearl River Library	Story Time Room	A	Door Outer Casing	Metal	multi-color	Intact	Negative	0.1	
20-1125	47	mg/cm2	5/14/2020 10:15:40	Pearl River Library	Story Time Room	A	Door Outer Casing	Metal	multi-color	Intact	Negative	0.3	
20-1125	48	mg/cm2	5/14/2020 10:15:49	Pearl River Library	Story Time Room	A	Door Outer Casing	Metal	multi-color	Intact	Negative	0.1	
20-1125	49	mg/cm2	5/14/2020 10:15:57	Pearl River Library	Story Time Room	A	Door Outer Casing	Metal	multi-color	Intact	Negative	0.2	
20-1125	50	mg/cm2	5/14/2020 10:16:58	Pearl River Library	Cpmference Room	D	Door Outer Casing	Metal	multi-color	Intact	Negative	0	
20-1125	51	mg/cm2	5/14/2020 10:17:07	Pearl River Library	Cpmference Room	D	Door Outer Casing	Metal	multi-color	Intact	Negative	0	
20-1125	52	mg/cm2	5/14/2020 10:21:49	Pearl River Library	Community Room	C	Wall	Drywall	Tan	Intact	Negative	0.1	
20-1125	53	mg/cm2	5/14/2020 10:23:31	Pearl River Library	Community Room	C	Baseboard	Wood	Brown	Intact	Negative	-0.2	
20-1125	54	mg/cm2	5/14/2020 10:24:27	Pearl River Library	Community Room	D	Window Case	Wood	White	Intact	Negative	-0.1	
20-1125	55	mg/cm2	5/14/2020 10:33:20	Pearl River Library	Hallway Ceiling by Mech. Room	Ceiling	Ceiling	Concrete	Black	Deteriorated	Negative	0.2	
20-1125	56	mg/cm2	5/14/2020 10:34:14	Pearl River Library	Hallway Ceiling by Mech. Room	Ceiling	Beam	Metal	Black	Intact	Negative	0.1	
20-1125	57	mg/cm2	5/14/2020 10:40:59	Pearl River Library	Supply & Storage Room	A	Wall	Drywall	Tan	Intact	Negative	0.1	
20-1125	58	mg/cm2	5/14/2020 10:41:24	Pearl River Library	Supply & Storage Room	D	Wall	Drywall	Tan	Intact	Negative	0.1	
20-1125	59	mg/cm2	5/14/2020 10:45:49	Pearl River Library	Book Sale Space	B	Wall	Drywall	Tan	Intact	Negative	0.1	
20-1125	60	mg/cm2	5/14/2020 10:46:23	Pearl River Library	Book Sale Space	B	Baseboard	Wood	Grey	Intact	Negative	0	
20-1125	61	mg/cm2	5/14/2020 10:47:38	Pearl River Library	Book Sale Space	C	Door Casing	Metal	White	Deteriorated	Negative	0	
20-1125	62	mg/cm2	5/14/2020 10:51:11	Pearl River Library	Circ Desk Area	C	Vent	Metal	Tan	Intact	Negative	0.2	
20-1125	63	mg/cm2	5/14/2020 10:51:48	Pearl River Library	Circ Desk Area	B	Wall	Drywall	Tan	Intact	Negative	0.2	
20-1125	64	mg/cm2	5/14/2020 10:52:16	Pearl River Library	Circ Desk Area	B	Baseboard	Wood	Brown	Deteriorated	Negative	-0.3	
20-1125	65	mg/cm2	5/14/2020 10:53:12	Pearl River Library	Circ Desk Area	D	Wall	Drywall	Tan	Intact	Negative	0.1	
20-1125	66	mg/cm2	5/14/2020 10:53:58	Pearl River Library	Circ Desk Area	D	Window Case	Wood	White	Intact	Negative	-0.2	
20-1125	67	mg/cm2	5/14/2020 10:55:36	Pearl River Library	New Materials Area	Center	Column	Drywall	Tan	Intact	Negative	0.1	
20-1125	68	mg/cm2	5/14/2020 10:57:58	Pearl River Library	New Materials Area	B	Wall	Drywall	Tan	Intact	Negative	0	
20-1125	69	mg/cm2	5/14/2020 10:58:24	Pearl River Library	New Materials Area	B	Baseboard	Drywall	Brown	Intact	Negative	-0.1	
20-1125	70	mg/cm2	5/14/2020 11:00:33	Pearl River Library	Pearl River Room	A	Baseboard	Drywall	Brown	Intact	Negative	-0.1	
20-1125	71	mg/cm2	5/14/2020 11:01:13	Pearl River Library	Pearl River Room	A	Wall	Drywall	Tan	Intact	Negative	0.2	
20-1125	72	mg/cm2	5/14/2020 11:01:43	Pearl River Library	Pearl River Room	A	Door ---	Wood	White	Intact	Negative	-0.2	
20-1125	73	mg/cm2	5/14/2020 11:04:36	Pearl River Library	Teen Area	D	Wall	Drywall	Light Green	Intact	Negative	0.1	
20-1125	74	mg/cm2	5/14/2020 11:05:34	Pearl River Library	Teen Area	D	Baseboard	Wood	Grey	Intact	Negative	-0.2	
20-1125	75	mg/cm2	5/14/2020 11:06:35	Pearl River Library	Teen Area	Center	Column	Drywall	Black	Intact	Negative	0.1	
20-1125	76	mg/cm2	5/14/2020 11:08:51	Pearl River Library	Learning Lab	B	Wall	Drywall	Tan	Intact	Negative	0.1	
20-1125	77	mg/cm2	5/14/2020 11:09:37	Pearl River Library	Learning Lab	Ceiling	Vent	Metal	Tan	Intact	Negative	0	
20-1125	78	mg/cm2	5/14/2020 11:13:14	Pearl River Library	Reading Areas	Center	Column	Drywall	Tan	Intact	Negative	0.3	
20-1125	79	mg/cm2	5/14/2020 11:15:14	Pearl River Library	Reading Areas	C	Wall	Metal	Tan	Intact	Negative	0.2	
20-1125	80	mg/cm2	5/14/2020 11:17:39	Pearl River Library	Reading Areas	B	Wall	Drywall	Tan	Intact	Negative	0.1	
20-1125	81	mg/cm2	5/14/2020 11:25:48	Pearl River Library	Exterior Frame	B	Support Column Trim	Wood	Red	Intact	Negative	0	
20-1125	82	mg/cm2	5/14/2020 11:27:08	Pearl River Library	Exterior Frame	B	Ceiling	Wood	White	Intact	Negative	0	
20-1125	83	mg/cm2	5/14/2020 11:29:40	Pearl River Library	Exterior Service Entrance	A	Exterior Door	Metal	White	Deteriorated	Negative	0.1	
20-1125	84	mg/cm2	5/14/2020 11:31:50	Pearl River Library	Exterior Front Entrance	A	Trim	Wood	Red	Intact	Negative	0	
20-1125	85	mg/cm2	5/14/2020 11:34:32	Pearl River Library	Exterior Front Entrance	A	Ceiling	Wood	White	Intact	Negative	0.1	
20-1125	86	mg/cm2	5/14/2020 11:35:08	Pearl River Library	Exterior Front Entrance	A	Door Frame	Wood	White	Intact	Negative	0.2	
20-1125	87	mg/cm2	5/14/2020 11:37:18	Pearl River Library		Celibration						1	
20-1125	88	mg/cm2	5/14/2020 11:37:32	Pearl River Library		Celibration						1.1	
20-1125	89	mg/cm2	5/14/2020 11:38:39	Pearl River Library		Celibration						1	
20-1125	90	mg/cm2	5/14/2020 11:39:00	Pearl River Library		Celibration						-0.1	
20-1125	91	mg/cm2	5/14/2020 11:39:10	Pearl River Library		Celibration						0.1	
20-1125	92	mg/cm2	5/14/2020 11:39:18	Pearl River Library		Celibration						0	

PCB

B1. Laboratory Analytical Reports

Omega Environmental Services, Inc. 280 Huyler Street - South Hackensack, NJ 07606 - Tel: (201) 489-8700 - Fax: (201)342-5412

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: EnvChemistry2@emsl.com

Attn: **Anton Rezin**
Omega Environmental Services
280 Huyler Street
South Hackensack, NJ 07606
Phone: (201) 489-8700
Fax: (201) 489-8797

6/9/2020

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 5/26/2020. The results are tabulated on the attached data pages for the following client designated project:

Pearl River Public Library 20-1125

The reference number for these samples is EMSL Order #012005165. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Approved By:

Phillip Worby, Environmental Chemistry
Laboratory Director

The test results contained within this report meet the requirements of NELAP and/or the specific certification program that is applicable, unless otherwise noted.
NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, CA ELAP 1877

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the NELAP, unless specifically indicated. All results for soil samples are reported on a dry weight basis, unless otherwise noted. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.EMSL.com EnvChemistry2@emsl.com

EMSL Order: 012005165
CustomerID: OMEG50
CustomerPO:
ProjectID:

Attn: **Anton Rezin**
Omega Environmental Services
280 Huyler Street
South Hackensack, NJ 07606

Phone: (201) 489-8700
Fax: (201) 489-8797
Received: 05/26/20 8:45 AM

Project: **Pearl River Public Library 20-1125**

Analytical Results

Client Sample Description 01 *Collected:* 5/14/2020 *Lab ID:* *012005165-0001*

Method	Parameter	Result	RL	Units	Prep Date & Analyst		Analysis Date & Analyst	
GC-SVOA								
3540C/8082A	Aroclor-1016	ND D	0.95	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1221	ND D	0.95	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1232	ND D	0.95	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1242	ND D	0.95	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1248	ND D	0.95	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1254	ND D	0.95	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1260	ND D	0.95	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1262	ND D	0.95	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1268	ND D	0.95	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH

Client Sample Description 02 *Collected:* 5/14/2020 *Lab ID:* *012005165-0002*

Method	Parameter	Result	RL	Units	Prep Date & Analyst		Analysis Date & Analyst	
GC-SVOA								
3540C/8082A	Aroclor-1016	ND	0.56	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1221	ND	0.56	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1232	ND	0.56	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1242	ND	0.56	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1248	ND	0.56	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1254	ND	0.56	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1260	ND	0.56	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1262	ND	0.56	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1268	ND	0.56	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH

Client Sample Description 03 *Collected:* 5/14/2020 *Lab ID:* *012005165-0003*

Method	Parameter	Result	RL	Units	Prep Date & Analyst		Analysis Date & Analyst	
GC-SVOA								
3540C/8082A	Aroclor-1016	ND	0.81	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1221	ND	0.81	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1232	ND	0.81	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1242	ND	0.81	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1248	ND	0.81	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.EMSL.com EnvChemistry2@emsl.com

EMSL Order:	012005165
CustomerID:	OMEG50
CustomerPO:	
ProjectID:	

Attn: **Anton Rezin**
Omega Environmental Services
280 Huyler Street
South Hackensack, NJ 07606

Phone: (201) 489-8700
Fax: (201) 489-8797
Received: 05/26/20 8:45 AM

Project: **Pearl River Public Library 20-1125**

Analytical Results

Client Sample Description 03 *Collected:* 5/14/2020 *Lab ID:* *012005165-0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date & Analyst*		*Analysis Date & Analyst*	
GC-SVOA								
3540C/8082A	Aroclor-1254	ND	0.81	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1260	ND	0.81	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1262	ND	0.81	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH
3540C/8082A	Aroclor-1268	ND	0.81	mg/Kg	6/1/2020	SM	06/02/20 0:00	EH

Definitions:
MDL - method detection limit
J - Result was below the reporting limit, but at or above the MDL
ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit (Analytical)
D - Dilution Sample required a dilution which was used to calculate final results

EMSL Analytical, Inc.

EMSL ANALYTICAL, INC.
LABORATORY PRODUCTS/TRAINING

Environmental Chemistry Chain of Custody

EMSL Order Number (Lab Use Only): 012005165

PHONE:
FAX:

Report To Contact Name: Anton Kezin		Bill To Company:	
Company Name: Omega Environmental Svcs		Attention To: Same	
Street: 280 Hupler St		Street:	
City: S. Hackensack State/Province: NJ Zip/Postal Code: 07606		City: State/Province: Zip/Postal Code:	
Phone: (201) 488-8700 Fax: (201) 342-5415		Phone: Fax:	
Project Name: Pearl River Public Library	Email Results To: anton@omega-env.com		Purchase Order:
U.S. State where Samples Collected: N.Y.	Number of Samples in Shipment: 3		Date of Shipment:
Sample for Compliance? Yes ☒ No ☐ If yes, NPDES? ☐ Other (Specify): Renovations	PWS ID #:		State Reporting Required? (Y/N)
Samples Collected by: EMSL ☐ Client ☒ check one	Sampled By (Signature): Anton Kezin		Samples Received Chilled? (Y/N) Y
Standard Turnaround Time: ☒ 2 Weeks	The following TATs are subject to lab approval: ☐ 1 Week ☐ 4 Days ☐ 3 Days ☐ 2 Days ☐ 1 Day		

Failure to complete will hinder processing of samples

Client Sample ID	Comp	Grab	Collect Date/Time	Matrix (W=Water, S=Soil, A=Air, SL=Sludge, O=Other)	Preservative (1=HCL, 2=HNO3, 3=H2SO4, 4=ICE, 5=Other)	List Test(s) Needed	Comments
01	☐	☐	5/14/2020	Caulking	N/P	PCB's on caulking	Job # 20-1125
02	☐	☐	"	"	"	✓	
03	☐	☐	"	"	"	✓	
	☐	☐				✓	
	☒	☐					

Released By (Signature)	Date & Time	Received By	Date & Time
Anton Kezin	5/22/2020	Barbara Cash	5/26/20 8:45am

Please indicate reporting requirements: ☒ Results Only ☐ Results and QC ☐ Reduced Deliverables ☐ Hiresult EDD ☐ Excel Other _____

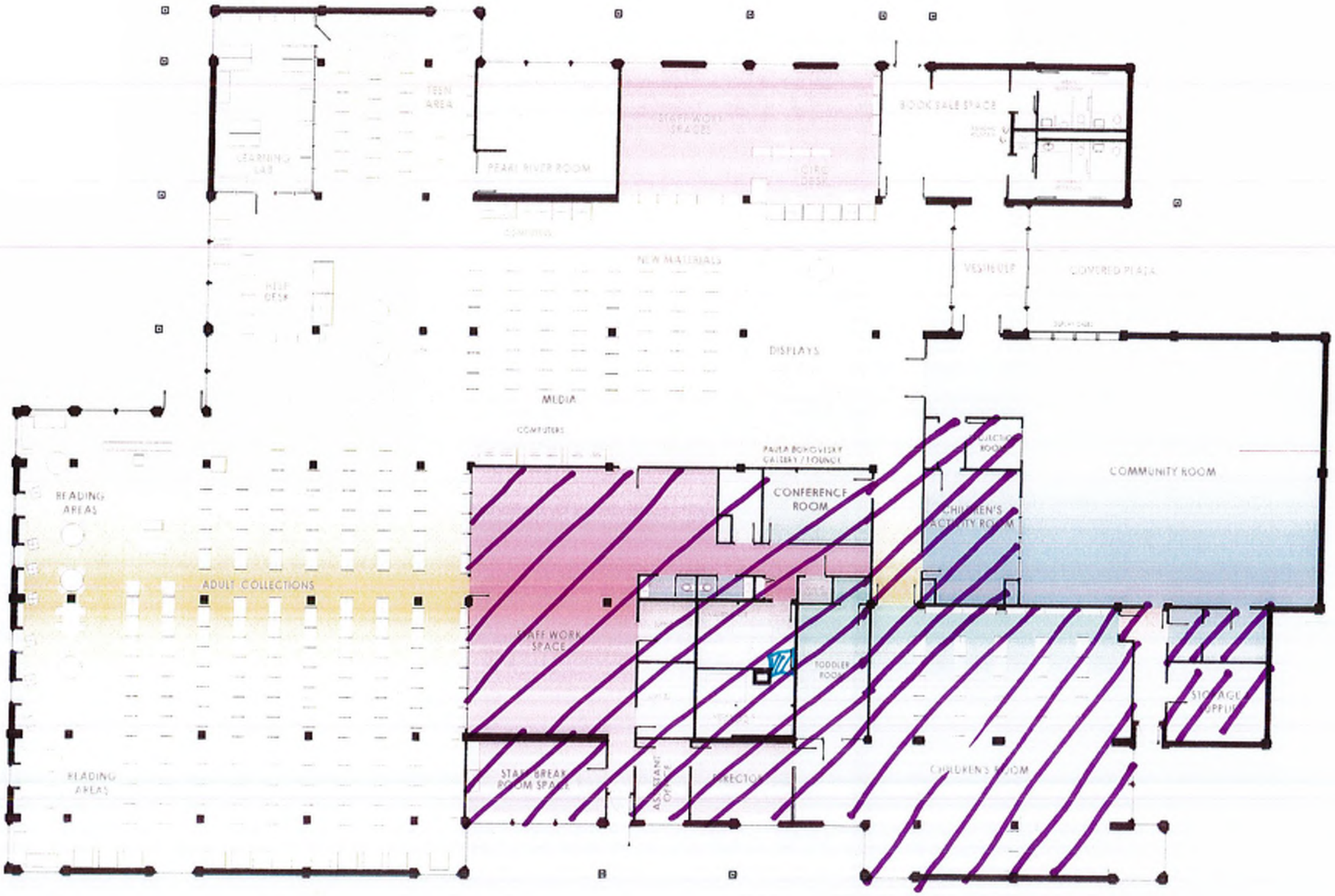
Instructions or Comments: Job # 20-1125 PCB's Only rcvd in plastic

Note: Field pH and Field Temperature are tested on the same day as the date of sample collection. (Lab) Received Temperature: 21 °C

Page 1 of ____ pages

OrderID: 012005165

Drawings



AREA with ACM mastic

5,500 SF

☑ confirmed positive ACM door insulation (possible other doors with similar insulation)

** must check doors Before work begins (245F confirmed)

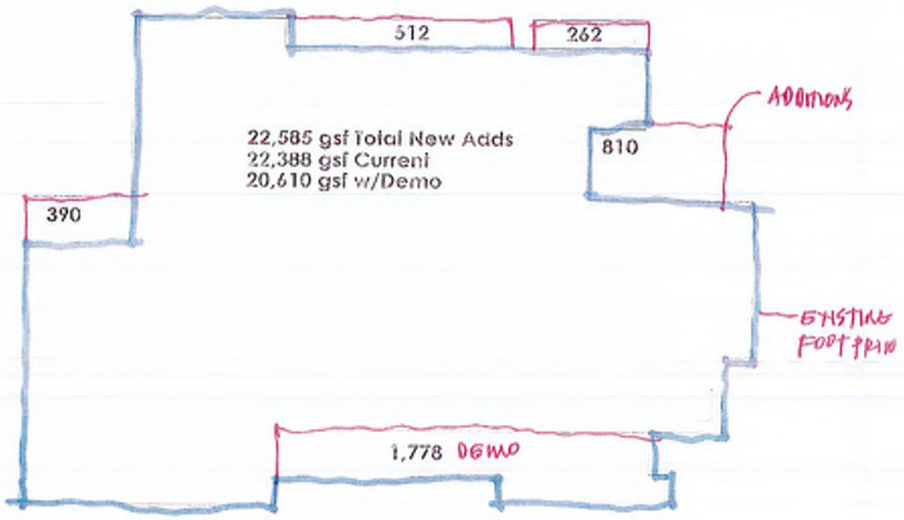
BUTLER ROWLAND MAYS ARCHITECTS, LLP

SCALE: 1/8" = 1'-0"

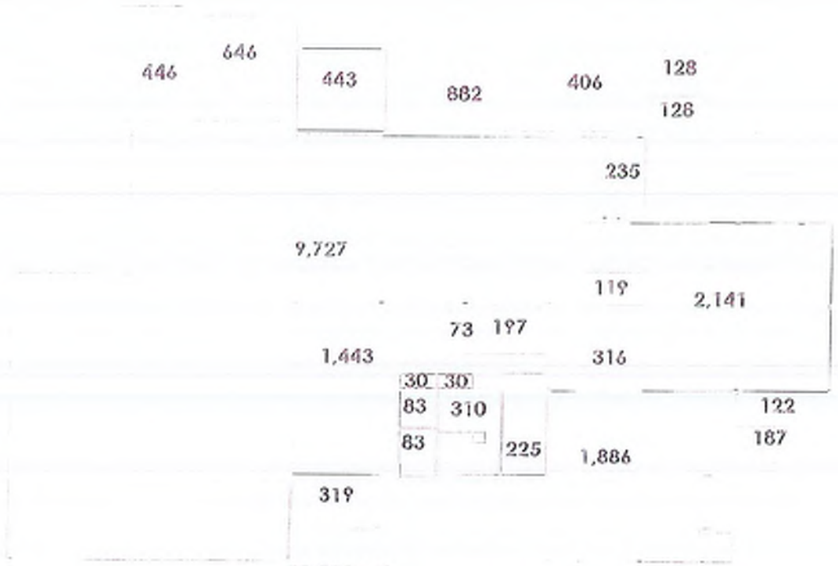
MASTER PLAN
EXISTING CONDITIONS - MAIN FLOOR

01-23-2020

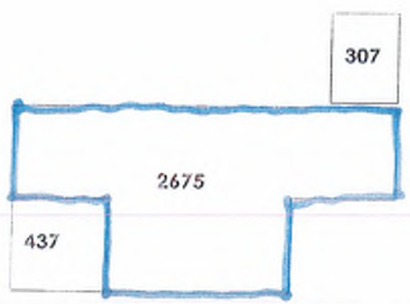
Pearl River Public Library



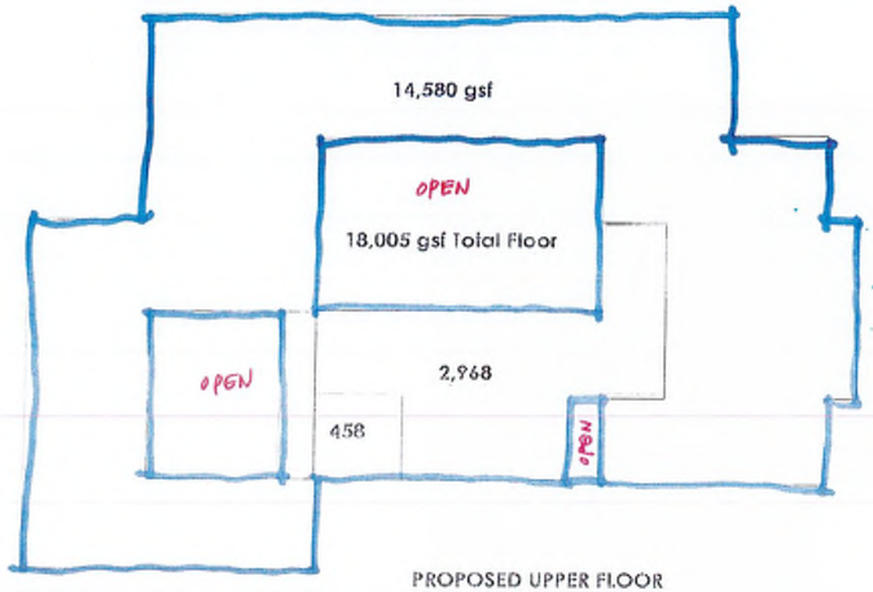
PROPOSED MAIN FLOOR



20,565 gsf
EXISTING MAIN FLOOR



EXISTING UPPER FLOOR



PROPOSED UPPER FLOOR

BUTLER ROWLAND MAYS ARCHITECTS, LLP

MASTER PLAN
SQUARE FOOTAGES

01-23-2020 4/8/2020 NOTE

C

Pearl River Public Library

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Omega Laboratories, Inc.
280 Huyler Street
S. Hackensack, NJ 07606

FILE NUMBER: 99-0200
LICENSE NUMBER: 29573
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 02/27/2020
EXPIRATION DATE: 02/28/2021

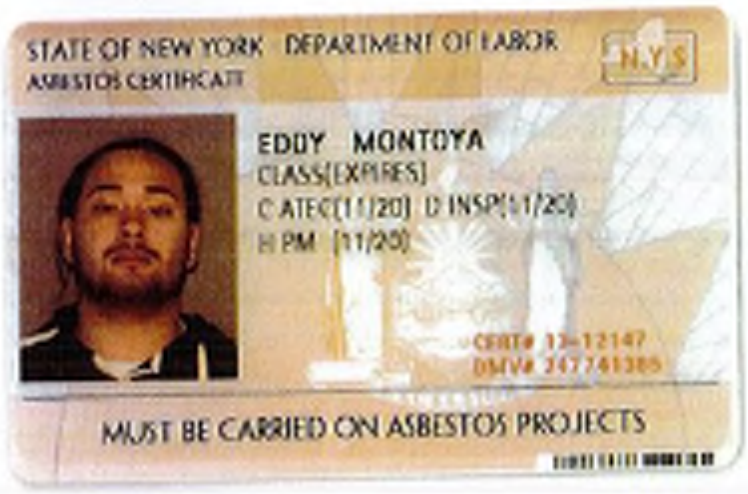
Duly Authorized Representative – Gary Mellor

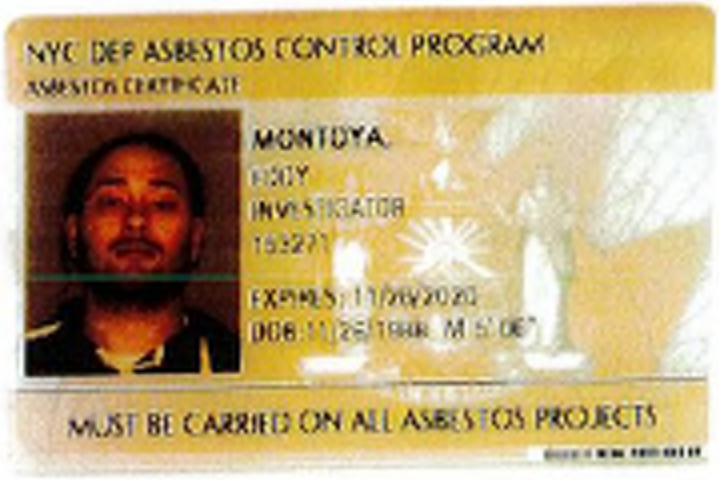
This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

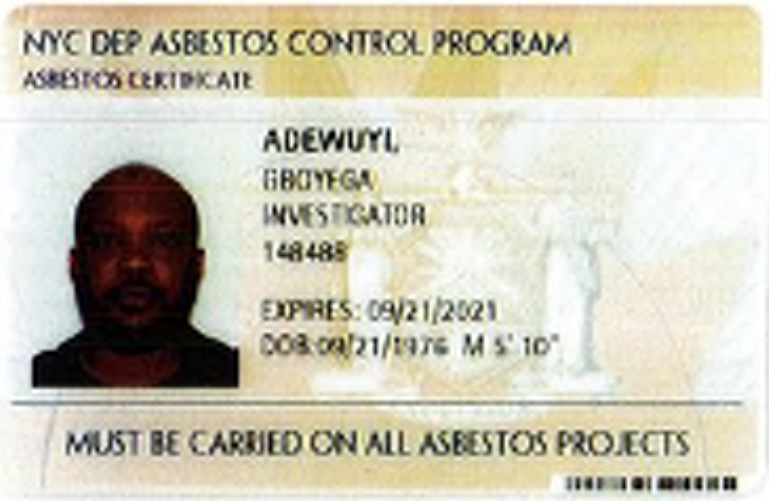
This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

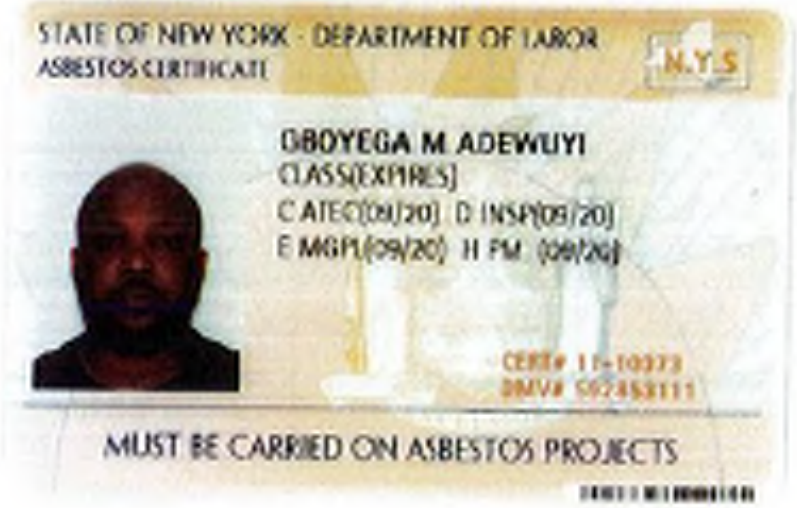
Eileen M. Franko, Director
For the Commissioner of Labor

DH 432 (8/12)


STATE OF NEW YORK DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE
N.Y.S.
EDDY MONTOYA
MUST BE CARRIED ON ASBESTOS PROJECTS


NYC DEP ASBESTOS CONTROL PROGRAM
MONTOYA
EDDY
INVESTIGATOR
MUST BE CARRIED ON ALL ASBESTOS PROJECTS


NYC DEP ASBESTOS CONTROL PROGRAM
ASBESTOS CERTIFICATE
ADEWUYI,
GBOYEGA
INVESTIGATOR
148488
EXPIRES: 09/21/2021
DOB:09/21/1976 M 5' 10"
MUST BE CARRIED ON ALL ASBESTOS PROJECTS


STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE
N.Y.S
GBOYEGA M ADEWUYI
CLASS[EXPIRES]
CATEG[09/20] D INSP[09/20]
E MGPL[09/20] H PM [09/20]
MUST BE CARRIED ON ASBESTOS PROJECTS

United States Environmental Protection Agency

This is to certify that

Omega Environmental Services, Inc.

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires November 16, 2022

LBP-10722-2
Certification #

May 16, 2019
Issued On

Michelle Price, Chief
Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that

Keri-Dean L Scarlett

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

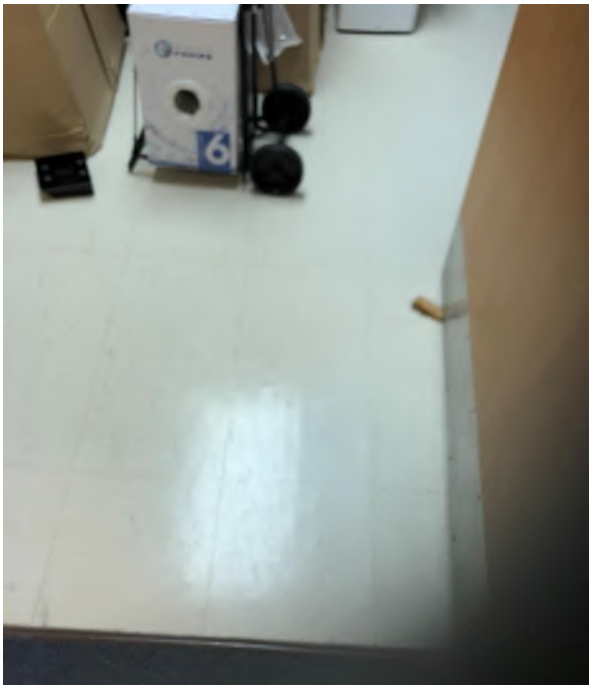
This certification is valid from the date of issuance and expires September 06, 2020

LBP-R-I179100-1
Certification #

August 23, 2017
Issued On

John Gorman, Chief
Pesticides & Toxic Substances Branch

Photos



12x12 White Tile

12x12 with Yellow Streaks

12x12 Tile with Brown Streaks

Beige Duct Caulk

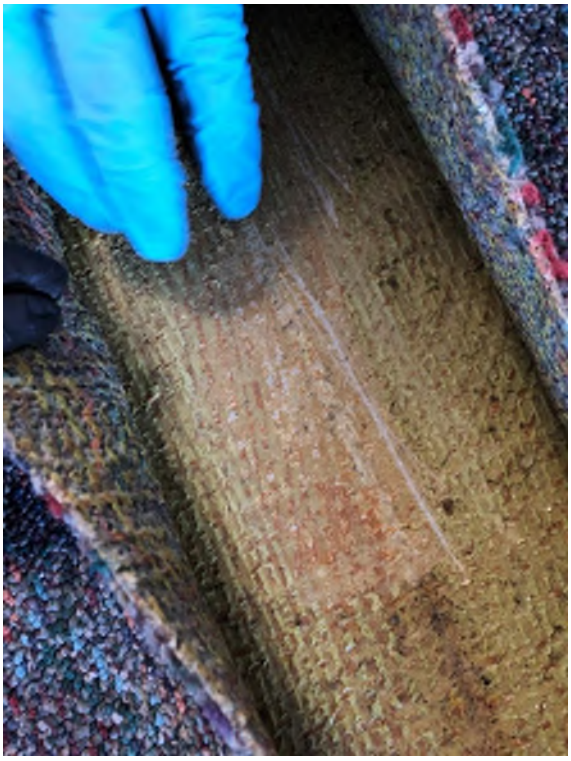
Black Mastic on Floor

Black Mastic on Wall

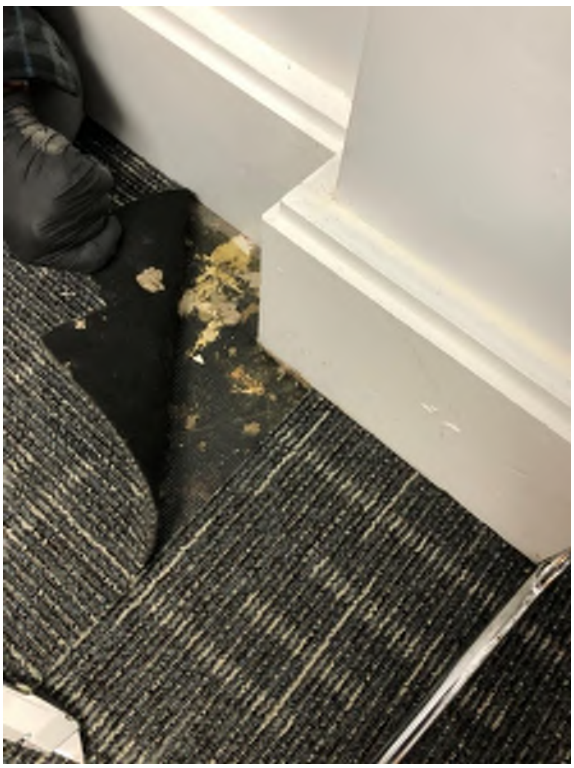
Black Material Under HVAC Unit

Boiler Flute Caulk

Bumpy 2x2



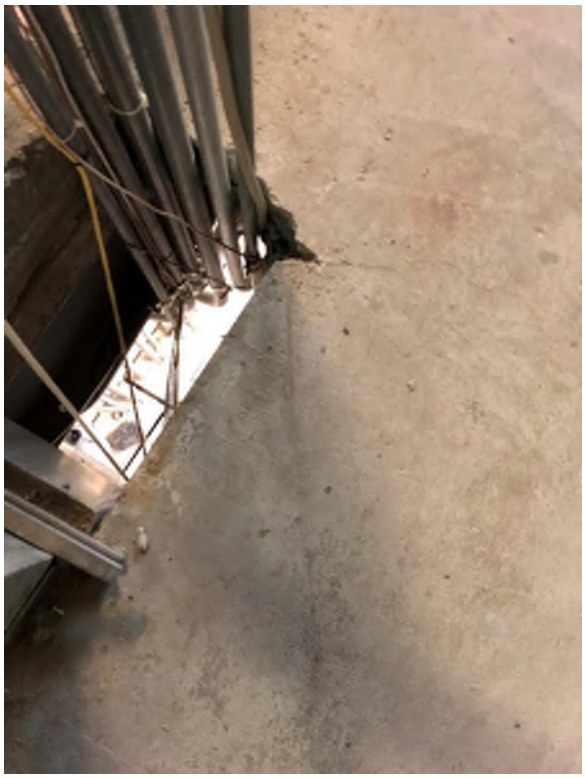
Carpet Glue in Library



Carpet Glue

Caulk Around Metal Flashing

CMU & Mortar



Concrete Slab

Damaged Fittings

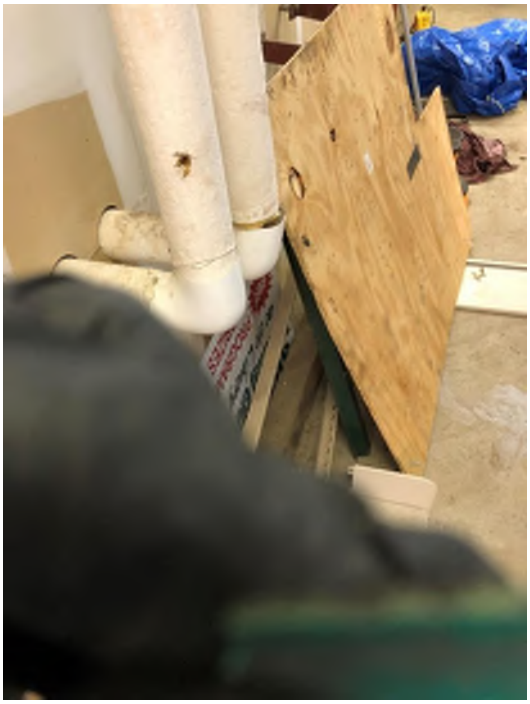
Door Insulation

Drywall

Fiberglass Pipes

Flashing

Gold Duct Caulk



Green Gasket

Joint Compound

Mastic Under 12x12 with Brown Streaks

Mastic Under Yellow Streaks Tile

Pinhole 2x2

Q-Deck

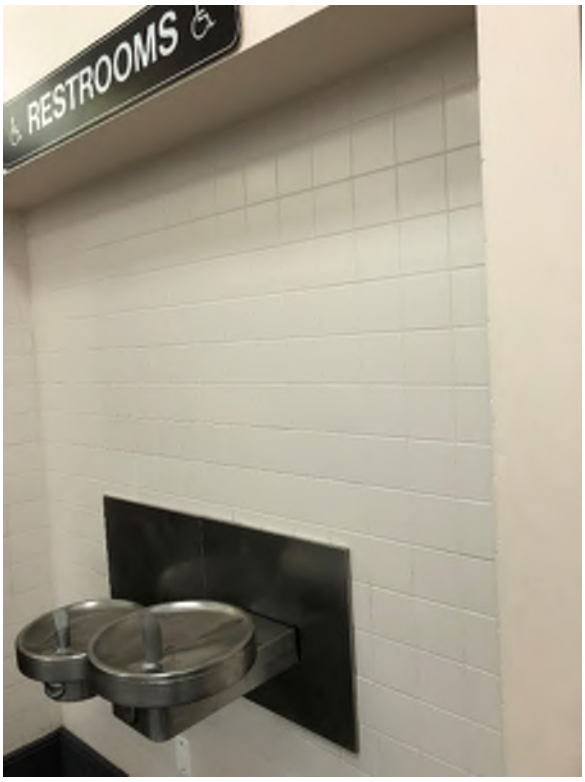
Red Gasket

Roof Elevation 1

Sink Undercoating

Skylight Caulk

Vibration Isolators



Wall Grout

Window Caulk Interior

Window Glazing

SECTION 990003
APPENDIX COVER 'C'

PEARL RIVER PUBLIC LIBRARY

80 Franklin Avenue
Pearl River, NY 10965

APPENDIX 'C'
GEOTECHNICAL REPORT

END OF SECTION

CARLIN • SIMPSON & ASSOCIATES, LLC

Consulting Geotechnical and Environmental Engineers

61 Main Street, Sayreville, New Jersey 08872
Tel. (732) 432-5757
Fax. (732) 432-5717

Principal:
Robert B. Simpson, P.E.

Associates:
Meredith R. Anke, P.E.
Michal Wroblewski, P.E.
Catherine Andersen, P.E.
Kurt W. Anke
Eric J. Shaw

18 April 2024

Lothrop Associates
333 Westchester Ave.
White Plains, NY 10604

Attn: Ms. Kathleen Sowle, RA
Senior Architect
Senior Project Manager

Re: Report on Subsurface Soil and Foundation Investigation
Proposed Lobby/Vestibule
Pearl River Public Library
80 Franklin Avenue
Pearl River, NY (CSA Job #24-07)

Dear Ms. Sowle:

In accordance with our proposal dated 12 January 2024 and your subsequent authorization, we have completed a Subsurface Soil and Foundation Investigation for the referenced site. The purpose of this study was to determine the nature and engineering properties of the subsurface soil and the groundwater conditions for the new structure, to recommend a practical foundation scheme, and to determine the allowable bearing capacity of the site soils.

We understand that the planned construction will consist of a new vestibule to the main entrance of the library. Site development may also include new underground utilities. To guide us in our study, you have provided us with concept plans that indicate the location of the proposed construction.

Our scope of work for this project included the following:

1. Reviewed the proposed layout, the existing site conditions, the expected soil conditions, and planned this study.

2. Retained Environmental Technical Drilling Inc., Inc. to advance two (2) test borings at selected locations on the subject site.

3. Laid out the boring locations in the field, visually identified the soil layers encountered, obtained soil samples, and prepared detailed boring logs and a Boring Location Plan.

4. Analyzed the field data and prepared this report containing the results of this study.

1.0 SITE DESCRIPTION

The project site is located at 80 Franklin Avenue in Pearl River, New York. The site is currently occupied by the existing Pearl River Public Library building. The remainder of the site is covered by concrete sidewalks and landscape areas. The site grades were unknown at the time of writing this report, but they were observed to be relatively flat.

2.0 PROPOSED CONSTRUCTION

We understand that the planned construction will consist of a new vestibule at the main entrance to the building. Site development may include new underground utilities. The vestibule finished floor elevation and proposed site grades were not known at the time of this report. However, we anticipate that only minor cuts and fills will be required to achieve the final grades. In addition, an existing sanitary sewer line cross through the proposed vestibule area.

The following evaluation is based on the information that has been provided to our office as of the date of this report. Once the planned construction has been further developed, a copy of the final plans should be forwarded to our office so that we can review them along with the recommendations in this report. At that time, any changes or additional recommendations can be provided, if required.

3.0 SUBSURFACE CONDITIONS

To determine the subsurface soil and groundwater conditions at the site, two (2) test borings were advanced by Environmental Technical Drilling, Inc. at the locations shown on the enclosed Boring Location Plan. The borings were performed with hollow stem augers and split spoon sampling. The borings were completed in March 2024, under the full-time inspection of Carlin-Simpson & Associates. Detailed boring logs have been prepared and are included in this report. Our field engineer visually identified all of the soil samples obtained during the boring operations. Select soil samples were tested in our laboratory.

3.1 Soils

The soil descriptions shown on the boring logs are based on the Burmister Classification System. In this system, the soil is divided into three components: Sand (S), Silt ($) and Gravel (G). The major component is indicated in all capital letters, the lesser in lower case letters. The following modifiers indicate the quantity of each lesser component:

Modifier	Quantity
trace (t)	0 -10%
little (l)	10% - 20%
some (s)	20% - 35%
and (a)	35% - 50%

The Unified Soil Classification System (USCS) symbol was determined for each major soil stratum and indicated on the attached boring logs. The subsurface soil conditions observed in the borings can be summarized as follows:

Stratum 1 Concrete — The surface layer in both of the borings consists of concrete that ranges from approximately 4 to 7 inches in thickness. Wire mesh was noted in the concrete.

Stratum 2 Existing Fill — Underlying the concrete both borings is loose to medium dense existing fill that generally consists of brown coarse to fine SAND, little Silt, trace (to little) coarse to fine Gravel. Cobbles were noted in this stratum in boring B-1. The existing fill extends to depths of 4'0" and 3'0" below the existing ground surface in boring B-1 and B-2, respectively.

Stratum 3 Buried Topsoil — Below the existing fill in both borings is a buried topsoil layer that is approximately 1'0" in thickness. The buried topsoil layer generally consists of dark gray SILT some, coarse to fine Sand with trace fine roots. This stratum consists mostly of soil with less than 1% percent of fine organics.

Stratum 4 Silty Sand with Gravel [USCS: SM] — Beneath the buried topsoil layer in both borings is medium dense to dense brown, gray brow coarse to fine SAND, little (to some) Silt, trace (to some) coarse to fine Gravel. Cobbles were noted in this stratum in boring B-1. Soil mottling was noted in this stratum in boring B-2 at a depth of 5'0" below the existing ground surface. Borings B-1 and B-2 were terminated in this stratum at depths of 15'0" and 17'0" below the existing ground surface, respectively.

3.2 Groundwater

Observations for groundwater were made during sampling and upon completion of the drilling operations at each boring location. During this investigation, groundwater was encountered in borings B-1 and B-2 at depths of 7'3" to 7'0" below the existing ground surface, respectively. Evidence of seasonal high groundwater (i.e. mottling) was encountered in boring B-2 at a depth of 5'0". The groundwater observations are summarized in Table 1 below.

Based on the observed groundwater level groundwater and the proposed construction groundwater is unlikely to be encountered during construction. In the event that perched water or groundwater is encountered, proper groundwater control measures will be required in the site excavations. Variations in the location of the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, and other factors not immediately apparent at the time of this exploration.

3.3 Summary of Boring Observations

Borings B-1 and B-2 were performed in the area of the proposed vestibule. A summary of the boring observations is provided in Table 1 below.

Table 1 – Summary of Boring Observations

Boring No.	Depth to Groundwater	Depth to Bottom of Existing Fill	Depth to Bottom of Buried Topsoil Layer
B-1	7'3"	4'0"	5'0"
B-2	7'0" SHGW @ 5'0"	3'0"	4'0"

SHGW – Evidence of Seasonal High Groundwater (i.e. mottling)

4.0 SUMMARY OF DESIGN RECOMMENDATIONS

Below is a summary of the major design and construction considerations for this project. Additional recommendations are provided in the following sections of this report.

- *Subsurface Conditions (Section 3.0)*
  - Existing fill was encountered to depths of 4'0" and 3'0" below the existing ground surface in boring B-1 and B-2, respectively.
  - A buried topsoil layer that is approximately 12 inches in thickness was encountered to depths of 4'0" to 5'0" below the existing ground surface.
  - Groundwater was encountered at depths of 7'3" and 7'0" below existing ground surface in borings B-1 and B-2, respectively.
  - A summary of the subsurface observations is provided in Table 1 above.

- *New Structure Site Preparation (Section 5.1)*
  - Surface materials must be stripped from proposed construction area.
  - Exposed subgrade soil shall be densified prior to excavating foundations.
  - New backfill shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D-1557).

- *New Structure Foundation Recommendations (Section 5.2)*
  - The existing fill and buried topsoil are not suitable bearing materials for support of the proposed vestibule foundations.
  - The new vestibule foundations shall be lowered to bear directly on virgin soil below the unsuitable materials.
  - Alternatively, the existing fill can be completely removed from below the foundation areas and replaced with new compacted fill.
  - Where adjacent to the existing building, the building addition foundations must bear at the same elevation as the existing building.
  - The new foundations may be designed as spread footing type foundations bearing on virgin soil or engineer-approved compacted fill.

- Net design bearing pressure is 4,000 psf.
- Minimum depth for frost protection is 42 inches.
- Seismic Site Class is D or Stiff Soil Profile.

- *Floor Slab Recommendations (Section 5.3)*
  - The existing fill can be densified in-place for support of the proposed floor slab.
  - The floor slab may be designed as slab on grade.
  - Modulus of subgrade reaction is 200 pci.

- *Additional Site Recommendations (Section 6.0)*
  - Utilities (Section 6.1): New utilities may bear in the densified existing fill, virgin soil, or new compacted fill.

5.0 NEW STRUCTURE EVALUATION

We understand that the planned construction will consist of a new vestibule structure. The vestibule finished floor elevation and proposed site grades were not known at the time of this report. However, we anticipate that only minor cuts and fills will be required to achieve the final grades. In addition, an existing sewer line crosses through the proposed vestibule area. A summary of the boring observations performed in the proposed vestibule area is provided in Table 1 above.

Where adjacent to the existing building, the new structure foundations must bear at the same elevation as the existing building foundation. Test pits can be performed to evaluate the depth and bearing material of the existing footings. New foundations adjacent to the existing foundations is furthered discussed in Section 5.2 below.

Existing fill was encountered to depths of 4’0” and 3’0” below the existing ground surface in boring B-1 and B-2, respectively. A buried topsoil layer that is approximately 12 inches in thickness was encountered to depths of 4’0” to 5’0” below the existing ground surface. The depth of the existing fill and buried topsoil is expected to be variable and may be deeper in unexplored areas of the site. The existing fill and buried topsoil are not an acceptable bearing materials for the new foundations. The consistency and density of the soil fill are not predictable. Certain areas may contain clean dense soils while other areas may contain loose material, void spaces, and/or debris. The existing soil fill and buried topsoil layers create the possibility of intolerable differential settlements under loading.

To eliminate the potential for damaging differential settlements, the new structure foundations shall be lowered to bear directly on the virgin silty sand with gravel (Stratum 4, USCS: SM) below the unsuitable soil layers approximately 4’0” to 5’0” below the existing ground surface elevation or bear on new engineer approved compacted fill. Where the unsuitable soil extends beyond a depth where lowering the proposed footings is practical, it should be removed to virgin soil and replaced with new compacted fill to the planned subgrade elevation. Recommendations for preparation of the site are provided in Section 5.1. Foundation recommendations for the new structure are provided in Section 5.2 below. In our opinion, the existing fill can be adequately densified in place to support the floor slab. The proposed structure

floor slab may be designed as slab on grade bearing on densified existing fill, new compacted fill, or densified virgin soils. Floor slab recommendations can be found in Section 5.3 below.

5.1 New Structure Area Preparation

In order to prepare the site for construction, all surface materials such as concrete shall be removed from the planned structure area, extending at least ten (10) feet beyond the new construction limits, where practical.

Existing utilities, where they are encountered within the planned structure area, should be either abandoned or rerouted around the new structure. Once the utility has been rerouted or abandoned, the section of pipe and any associated structure within the building area should be completely removed. The removal of the pipe and structure must also include any loose fill around the pipe or structure. After the pipe, associated structure, and associated loose backfill have been removed, the resulting excavation shall be backfilled with new controlled fill as described below.

Handling Groundwater and Wet Subgrades During Construction (If Required)

During our investigation, groundwater was encountered at depths of 7’3” and 7’0” below existing ground surface in borings B-1 and B-2, respectively. Evidence of seasonal high groundwater (i.e. mottling) was observed at a depth of 5’0” below the existing ground surface in boring B-2. We do not expect groundwater to be encountered during construction however, the excavations to lower the proposed foundations will extend to within 2’3” of the groundwater table. These foundation excavations or deeper excavations for utilities may encounter perched groundwater and wet subgrades. Where these conditions exist dewatering with sumps and pumps will be required.

In the event that the exposed subgrade (i.e. foundation excavation) becomes wet or soft, stabilizing the subgrade surface will be required in order to construct it. The subgrade should be stabilized with geotextile stabilization fabric (i.e. Mirafi 500X or approved equivalent) and crushed stone to provide a working platform and support for the new building in that area. If destabilization of the subgrade does occur, Carlin-Simpson & Associates can provide further directions during construction.

Densification of Subgrade Soils (Proofrolling)

After the surface materials are removed as outlined above, the exposed subgrade shall be proofrolled with at least five (5) passes of a large vibratory drum roller (i.e. Dynapac CA 250 or equivalent). The proofrolling is necessary to densify the underlying soils. The proofrolling must be performed prior to the excavation for new foundations and the placement of new fill in the structure area. In areas where the existing subgrade is to be cut, the proofrolling of the subgrade in those areas should be performed once the proposed subgrade is achieved.

A representative from Carlin-Simpson & Associates or qualified geotechnical engineering firm shall observe the proofrolling operation. If any excessive movement is noted during the proofrolling, the unstable soil shall be removed and replaced with new compacted fill. The Carlin-Simpson & Associates representative or a qualified geotechnical engineering firm shall be responsible for determining what material, if any, is to be removed and will direct the contractor during this operation. Proofrolling may be omitted, if determined by the Carlin Simpson representative or qualified geotechnical engineer, that it will cause the subgrade to destabilize.

Installation of New Structural Fill

New fill required to achieve final grades shall consist of either engineer-approved on-site soil or imported sand and gravel. Imported sand and gravel shall contain less than 20% by weight passing a No. 200 sieve. The new fill shall be placed in layers not exceeding one (1) foot in thickness and each layer shall be compacted to at least 95% of its Maximum Modified Dry Density (ASTM D1557). Each layer must be compacted, tested, and approved by the Carlin-Simpson & Associates field representative or a qualified geotechnical engineering firm prior to placing subsequent layers. The suitability of the excavated soil for reuse as compacted structural fill is discussed in Section 6.4 below.

If imported structural fill is required during construction, the imported structural fill shall meet the following specified gradation:

US Standard Sieve Size	Percent Finer By Weight
3 inch	100
No. 4	30-80
No. 40	10-50
No. 200	0-20

5.2 New Structure Foundations

The new foundations may be designed as shallow foundations bearing on virgin soils or new compacted fill. Unsuitable soil (i.e. existing fill and buried topsoil) was encountered in the proposed vestibule area to depths of 5’0” and 4’0” below the existing ground surface elevation in borings B-1 and B-2, respectively.

An existing sanitary sewer line crosses through the proposed vestibule area. If new foundations are planned near the sewer line, they must be designed so that they do not surcharge the sewer line. This can be accomplished by lowering the proposed foundations to bear below the bottom of sewer line elevation.

The new structure foundations may be designed as shallow spread footings lowered to bear on virgin soil. Alternatively, where the existing fill extends below the planned foundation bearing elevation, the existing fill must be completely removed from beneath the “zone of influence” of the new foundations. At the bottom of the excavation, the removal of the existing fill shall extend horizontally beyond the foundation footprint a minimum distance equal to the

depth of the excavation below the planned foundation bearing elevation on each side of the foundation. For example, if the removal of the existing fill extends vertically 2'0" below the planned foundation bearing elevation, the excavation must extend horizontally a minimum of 3'0" (1'0" plus 2'0") beyond the new structure limits at that location. The foundation design parameters in Table 2 below shall be used for design.

All foundations shall bear on the virgin soil or on new engineer-approved compacted fill. All of the exterior footings shall bear at the minimum depth listed below for protection from frost. Interior column footings must also be lowered to bear on the virgin soil. The footings shall have minimum dimensions as listed below.

Table 2 – New Structure Foundation Design Parameters

Description	Value
Foundation Bearing Material	Virgin Soil or New Compacted Fill
Net Design Bearing Pressure	4,000 psf
Minimum Frost Depth	42 inches
Minimum Column Footing Dimension	30 inches
Minimum Wall Footing Dimension	18 inches

The excavations for the new foundations shall be performed under the full-time inspection of Carlin-Simpson & Associates or a qualified geotechnical engineering firm. The on-site representative shall confirm that the foundation bearing material is capable of supporting the design bearing pressure.

Prior to the installation of the reinforcement steel and concrete, the bottoms of the foundation excavations should be cleaned of all loose material. The foundation subgrade shall be compacted with a small vibratory drum trench compactor (i.e. Wacker Model RT560), a heavy vibratory plate tamper (i.e. Wacker BPU 3545A or equivalent), or a "jumping jack" style tamper (i.e. Wacker Model BS 600). The preparation of the footing bearing subgrade should be performed under the observation of a representative from Carlin-Simpson & Associates or a qualified geotechnical engineering firm. If instability is observed during the compaction of the bearing subgrade, the soft soil shall be removed and replaced with new compacted fill.

New Footings Adjacent to Existing Foundations

Where the new footings are planned adjacent to the existing building foundations, the new foundation shall bear at the same elevation as the existing footings. This is required to ensure that the new foundation does not surcharge the existing foundation walls and to ensure that the new foundation does not bear on fill placed around the existing foundations of foundation walls.

If foundations are planned to connect to or be in very close proximity to existing building foundations, we recommend that one or two of test pits be performed adjacent to the existing building to evaluate the depth to the existing buildings foundation, bearing material, and presence of unsuitable material.

In the event that new footings will bear at a lower elevation than the adjacent existing foundations, underpinning of the existing foundations will be required. In addition, if the excavation to remove unsuitable soil extends below the adjacent building foundation construction, underpinning of the existing foundations will be required. If required, we anticipate that underpinning could be achieved using traditional underpinning techniques by which the area under the existing foundation is excavated and replaced with concrete to lower the existing foundation where necessary. However, the depth of underpinning with traditional methods will be limited due to the elevation of the groundwater table.

5.3 Floor Slab on Grade

We anticipate that small fills may be required in the proposed structure area to achieve the desired finished floor elevations. New fill for the floor slabs shall consist of either suitable on-site soil or imported sand and gravel. Imported sand and gravel shall contain less than 20% material by weight passing a No. 200 sieve and meet the gradation specified in Section "Installation of New Structural Fill" above. The new fill shall be placed in layers not exceeding one (1) foot in loose thickness and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557). Fill layers shall be compacted, tested, and approved before placing subsequent layers.

The floor may be designed as a slab on grade bearing on densified existing fill, densified virgin soil, or on new engineer-approved compacted fill. Floor slab design parameters are provided in Table 3 below. A layer of 3/4-inch crushed stone is recommended beneath the concrete slab for additional support and drainage.

Table 3 – Floor Slab Design Parameters

Description	Value
Slab Subgrade Material	Densified Existing Fill, Densified Virgin Soil, or New Compacted Fill
Modulus of Subgrade Reaction (k)	200 pci
Crushed Stone Cushion Thickness	6 inches

5.4 New Structure Settlement

Settlement of individual footings, designed in accordance with recommendations presented in this report, is expected to be within tolerable limits for the proposed structure. For footings placed on natural soils or new engineer-approved compacted fill approved by Carlin Simpson & Associates or a qualified geotechnical engineering firm, and constructed in accordance with the requirements outlined in this report. The maximum total settlement is expected to be on the order of 1-inch or less. Maximum differential settlement between adjacent columns or load bearing walls is expected to be ½-inch or less.

The above settlement values are based on our engineering experience with similar soil conditions and the anticipated structural loading. These estimated settlements are intended to guide the structural engineer with their design. It is critical that Carlin-Simpson & Associates or

a qualified geotechnical engineer be retained to observe the foundation bearing surfaces and to confirm the recommended bearing pressures during construction.

5.5 Seismic Design Considerations

From site-specific test boring data, the Site Class was determined from New York State Building Code Section 1613.2.2. The site-specific data used to determine the Site Class typically includes soil test borings to determine Standard Penetration resistances (N-values). Based on estimated average N-values in the upper 100 feet of soil profile, the site can be classified as Site Class D – Stiff Soil Profile.

New structures should be designed to resist stress produced by lateral forces computed in accordance with Section 1613 of the New York State Building Code. The values in Table 4 shall be used for this project.

Table 4 – Seismic Design Values

Description	Value
Mapped Spectral Response Acceleration for Short Periods, [Fig 1613.2.1 (1)]	S_S=0.298g
Mapped Spectral Response Acceleration at 1-Second Period, [Fig 1613.2.1 (2)]	S_1=0.062g
Site Coefficient [Table 1613.2.3 (1)]	F_a= 1.562
Site Coefficient [Table 1613.2.3 (2)]	F_v= 2.4
Max Considered Earthquake Spectral Response for Short Periods [Eq 16-36]	S_{MS}=0.465g
Max Considered Earthquake Spectral Response at 1-Second Period [Eq 16-37]	S_{M1}=0.148g
Design Spectral Response Acceleration for Short Periods [Eq 16-38]	S_{DS}=0.31g
Design Spectral Response Acceleration for 1-Second Period [Eq 16-39]	S_{D1}=0.098g

We expect that the proposed vestibule for the library will have a Risk Category of II. Based on this assumption, the Seismic Design Category (SDC) B. The Risk Category and SDC should be verified by the project structural engineer. In the event that the structure has a different Risk Category, the SDC should be updated in accordance with Section 1613 of the New York State Building Code.

Liquefaction Potential

Liquefaction is a phenomenon in which saturated or partially saturated soils lose strength and stiffness when subjected to earthquake-induced ground shaking. Ground shaking of sufficient duration results in the loss of grain-to-grain contact and collapse of the soil skeleton which causes stresses in the soil to be completely transferred to the pore water fluid. Liquefaction is most often observed in saturated, loose uniformly graded sandy soils at depths shallower than 50 feet below the ground surface. Factors known to influence liquefaction potential include composition and thickness of soil layers, grain size, relative density, groundwater level, degree of saturation, and both intensity and duration of ground shaking.

The liquefaction potential was evaluated with the available boring data, including the SPT blow counts, soil classification, total unit weight, soil fines content, and depth to groundwater. We have determined the potential for liquefaction of the non-cohesive soils below the groundwater table and less than 50 feet below the ground surface is considered unlikely. Therefore, a liquefaction evaluation is not required for the site.

6.0 SITE EVALUATION

Our recommendations for the proposed site development including new utilities, temporary excavation and bracing, and suitability of the existing site soils for reuse are provided below. A summary of the boring observations is provided in Table 1 above.

6.1 Utilities

Existing fill was encountered to depths of 4'0" and 3'0" below the existing ground surface in boring B-1 and B-2, respectively. A buried topsoil layer that is approximately 12 inches in thickness was encountered to depths of 4'0" to 5'0" below the existing ground surface. For areas where unsuitable material is encountered within the utility excavations, the subgrade at the bottom of the utility excavation shall be compacted in place with a vibratory drum trench compactor or "jumping jack" style tamper. Carlin-Simpson & Associates or a qualified geotechnical engineering firm must evaluate these areas for the presence of soft or unsuitable material within the existing fill matrix. If instability is observed, portions of this fill may have to be removed and replaced with new compacted fill. Carlin-Simpson & Associates or a qualified geotechnical engineering firm will determine this during construction. In areas where the buried topsoil layer is encountered at the bearing elevation of the new utility the buried topsoil must be over excavated and replaced with new compacted fill. New utilities are not permitted to bear directly on the buried topsoil layer.

New utilities may bear in the densified existing fill, densified virgin soils, or new compacted fill. The bottom of all trenches shall be excavated clean so a hard bottom is provided for pipe support. If any soft areas or unsuitable existing fill conditions are encountered during the construction operation, these materials must be removed and replaced with new compacted fill.

In the event that water is encountered within the utility trench excavation or if the trench bottom becomes soft due to the inflow of surface water or trapped water, a layer of geotextile filter fabric and a minimum of six (6) inches of crushed stone shall be placed on the bearing soil to provide a firm base for support of the pipe. Sump pits and pumps should be used to keep the excavations dry.

After the utility is installed, the trench must be backfilled with compacted fill. The fill shall consist of suitable on-site soil or imported sand and gravel containing less than 20% by weight passing a No. 200 sieve and meet the gradation specified in section "Installaton of New Structural Fill" above. Large rock fragments must not be placed directly against the pipe. Controlled compacted fill shall be placed in one (1) foot loose layers and each layer shall be compacted to at least 92% of its Maximum Modified Dry Density (ASTM D1557). The backfill must be free of topsoil, debris, and large boulders or rock fragments.

6.2 Temporary Construction Excavations and Excavation Protection

Temporary construction excavations should be conducted in accordance with the most recent OSHA guidelines or applicable federal, state or local codes. A qualified person should evaluate the excavations at the time of construction to determine the appropriate soil type and allowable slope configuration. Based on the boring data, we believe the site soils would have the following classifications as defined by the OSHA guidelines.

Soil Type	Possible Classification	Maximum Slope or Bench
Existing Fill	Type "C"	1½ H:1V
Virgin Soil	Type "B" or Type "C"	1H:1V or 1½ H:1V

Temporary support (i.e. trench boxes, sheeting and shoring, etc.) should be used for any excavation that cannot be sloped or benched in accordance with the applicable regulations, where necessary to protect adjacent property, utilities, driveways, and/or structures, or where saturated soils or water seepage is encountered within the excavation. In the event that water is encountered within the excavation, an evaluation of the excavation's stability must be performed. Perched water or groundwater encountered within the excavation will destabilize the sides of the excavation. Temporary support will be required to stabilize the excavation. Dewatering of the excavation will also be required.

A New York State licensed professional engineer must design all temporary and permanent support systems. The contractor will select the shoring type and submit design calculations for the proposed shoring method to Carlin-Simpson & Associates for review.

The soil adjacent to the temporary support system will exert a horizontal pressure against the system. This pressure is based on the soil unit weight, coefficient of active earth pressure, and depth of the excavation. In addition, the surcharge loads from adjacent driveways, construction equipment, or stored materials near the excavation must be incorporated into the design of the support system, as applicable. The design parameters for temporary excavation support systems are listed in Table 5 below.

Table 5 – Temporary Sheeting and Shoring Design Parameters

Description	Value
Moist Unit Weight (pcf)	130
Friction Angle (ϕ, deg)	30
Cohesion (c, psf)	0
Active Earth Pressure Coefficient (k_a)	0.33
Equivalent Fluid Pressure (pcf)	42.9
Passive Earth Pressure Coefficient (k_p)	3.0

6.3 Suitability of the In-Situ Soils for Use as Compacted Fill

The suitability of each soil stratum for use as compacted fill is discussed below.

Stratum 1 Concrete: Concrete is not suitable for use as compacted fill. During construction, it shall be stripped and removed from the site.

Stratum 2 Existing Fill: The existing fill generally consists of coarse to fine SAND, little Silt, trace (to little) coarse to fine Gravel. Cobbles were noted in this stratum in boring B-1. This material is generally suitable for use as compacted fill, provided that it remains relatively dry for optimum compaction prior to its use.

Stratum 3 Buried Topsoil: The buried topsoil layer generally consists of dark gray SILT some, coarse to fine Sand with trace fine roots. This stratum consisted mostly of soil with less than 1% percent of fine organics. The buried topsoil is not suitable for use as compacted fill. During construction, it shall be removed from the site.

Stratum 4 Silty Sand with Gravel [USCS: SM]: The virgin silty sand with gravel consists of coarse to fine SAND, little (to some) Silt, trace (to some) coarse to fine Gravel. Cobbles were noted in this stratum in boring B-1. This material is generally suitable for use as compacted fill, provided that it remains relatively dry for optimum compaction prior to its use and cobbles have been removed prior to reuse. Note that this stratum is located above and below the groundwater table. The site soils that extend below the groundwater table will be completely saturated and will need to undergo significant drying prior to reuse.

The boring observations indicate that the on-site soils contain a low to high percentage of silt (5.0% to greater than 50%). The moderate to high silt content soils will be moisture sensitive. If the soil becomes too wet, it will be difficult to achieve adequate compaction.

Proper moisture conditioning of the soil will be required. New compacted fill should be within 2% (+/-) of its optimum moisture content at the time of placement. In the event that the on-site material is too wet at the time of placement and cannot be adequately compacted, the soil should be aerated and allowed to dry or the material removed and a drier cleaner fill material used. In the event that the on-site material is too dry at the time of placement and cannot be adequately compacted, water may be needed to increase the soil moisture content for proper compaction.

The in-situ soils which exist throughout the site may become soft and weave if exposed to excessive moisture and construction traffic. The instability will occur quickly when exposed to these elements and it will be difficult to stabilize the subgrade. We recommend that adequate site drainage be implemented early in the construction schedule and if the subgrade becomes wet, the contractor should limit construction activity until the soil has dried.

The minimum compaction requirements for the various areas of the site are summarized in Table 6 below.

Table 6 - Minimum Compaction Requirements

Area	Maximum Modified Dry Density (ASTM D-1557)
Building (below foundations)	95%
Building Slab (above foundations)	92%
Pavement Areas	92%
Exterior Slabs and Sidewalks	92%
Utility Trenches	92%
Landscape Areas	90%

7.0 GENERAL

The findings, conclusions and recommendations presented in this report represent our professional opinions concerning subsurface conditions at the site. The opinions presented are relative to the dates of our site work and should not be relied on to represent conditions at later dates or at locations not explored. The opinions included herein are based on information provided to us, the data obtained at specific locations during the study and our past experience. If additional information becomes available that might impact our geotechnical opinions, it will be necessary for Carlin-Simpson & Associates to review the information, reassess the potential concerns, and re-evaluate our conclusions and recommendations.

Regardless of the thoroughness of a geotechnical exploration, there is the possibility that conditions between borings will differ from those encountered at specific boring or test pit locations, that conditions are not as anticipated by the designers and/or the contractors, or that either natural events or the construction process have altered the subsurface conditions. These variations are an inherent risk associated with subsurface conditions in this region and the approximate methods used to obtain the data. These variations may not be apparent until construction.

The professional opinions presented in this geotechnical report are not final. Field observations and foundation installation monitoring by the geotechnical engineer, as well as soil density testing and other quality assurance functions associated with site earthwork and foundation construction, are an extension of this report. Therefore, Carlin-Simpson & Associates should be retained by the Owner to observe all earthwork and foundation construction, to document that the conditions anticipated in this study actually exist, and to finalize or amend our conclusions and recommendations Carlin-Simpson & Associates is not responsible or liable for the conclusions and recommendations presented in this report if Carlin-Simpson & Associates does not perform the observation and testing services.

Therefore, in order to preserve continuity in this project, the Owner must retain the services of Carlin-Simpson & Associates to provide full time geotechnical related monitoring and testing during construction. At a minimum, this shall include the observation and testing of the following: 1) the removal of existing fill and unsuitable soil, where required; 2) the proofrolling of the subgrade soil prior to the placement of new compacted fill; 3) the placement

and compaction of controlled fill; 4) the excavation for the new foundations; and 5) the preparation of the subgrade for the floor slab.

This report has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty is expressed or implied. The evaluations and recommendations presented in this report are based on the available project information, as well as on the results of the exploration. Carlin-Simpson & Associates should be given the opportunity to review the final drawings and site plans for this project to determine if changes to the recommendations outlined in this report are needed. Should the nature of the project change, these recommendations should be re-evaluated.

This report is provided for the exclusive use of Lothrop Associates and the project specific design team and may not be used or relied upon in connection with other projects or by other third parties. Carlin-Simpson & Associates disclaims liability for any such third party use or reliance without express written permission. Use of this report or the findings, conclusions or recommendations by others will be at the sole risk of the user. Carlin-Simpson & Associates is not responsible or liable for the interpretation by others of the data in this report, nor their conclusions, recommendations or opinions.

If the conditions encountered during construction vary significantly from those stated in this report, this office should be notified immediately so that additional recommendations can be made.

Thank you for allowing us to assist you with this project. Should you have any questions or comments, please contact this office.

Very truly yours,

CARLIN-SIMPSON & ASSOCIATES, LLC

MICHAL WROBLEWSKI, P.E.
Project Engineer

ROBERT B. SIMPSON P.E.
Principal

File No. 24-07

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-1
Project: Proposed Lobby/Vestibule, 80 Franklin Ave, Pearl River NY		**SHEET NO.:** 1 of 1
Client: Lothrop Associates		**JOB NUMBER:** 24-07
Drilling Contractor: Environmental Technical Drilling		**ELEVATION:** -

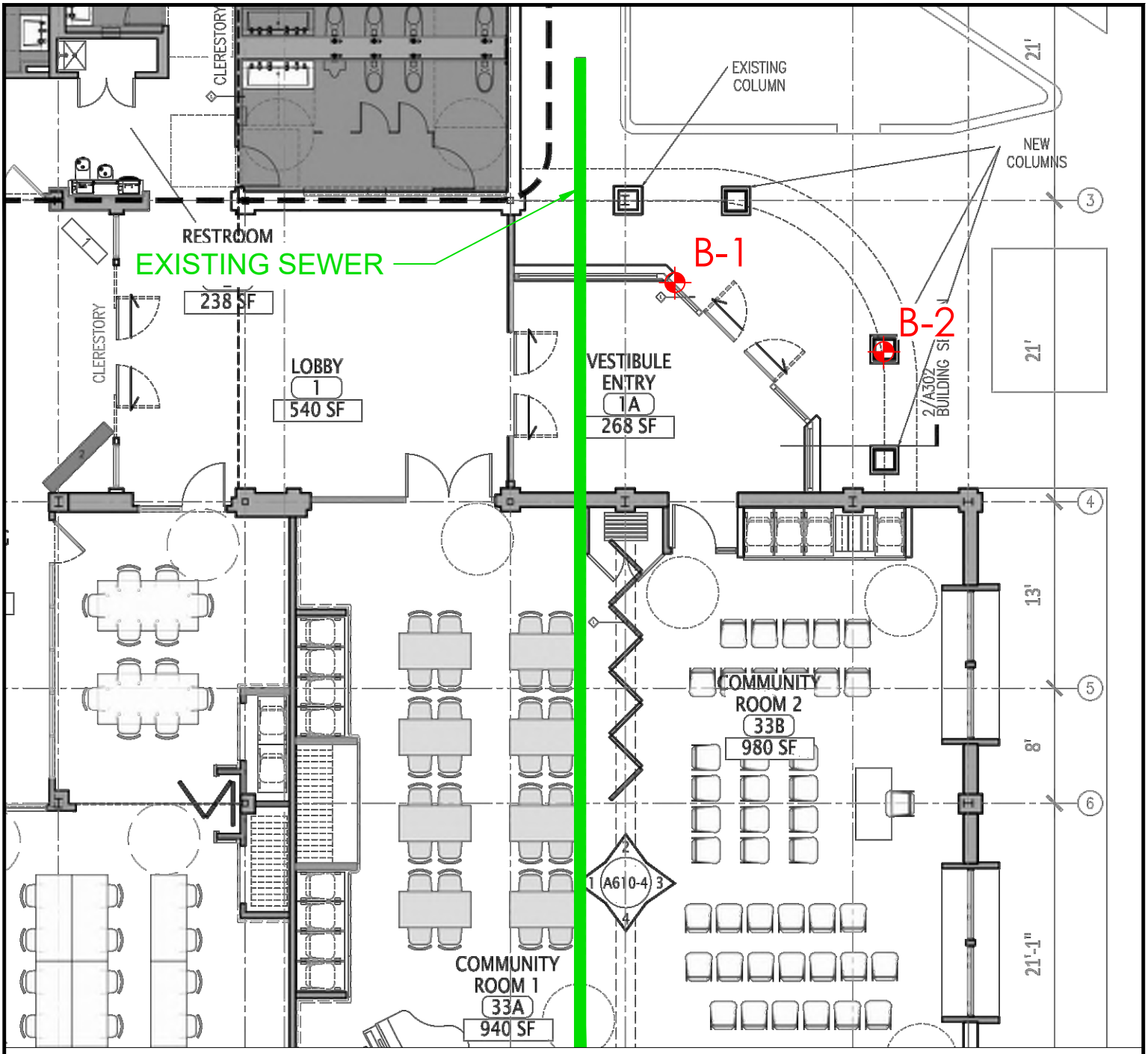
GROUNDWATER					CASING	SAMPLE	CORE	TUBE	**DATUM:** -
DATE	**TIME**	**DEPTH**	**CASING**	**TYPE**	**HSA**	**SS**			**START DATE:** 22/Mar/24
22/Mar/24	**1130**	**7'3"**	**HSA**	**DIA.**	**2 1/4"**	**1 3/8"**			**FINISH DATE:** 22/Mar/24
				WGHT		**140#**			**DRILLER:** M Kane
				FALL		**30"**			**INSPECTOR:** KWA

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION		REMARKS
1					**Concrete slab with mesh**	0'7"	
2		**S-1**	8 10		**FILL (Brown coarse to fine SAND, little (-) Silt**	2'0"	Rec = 20"
3			18 17		**FILL (Brown coarse to fine SAND, little (+) Silt, trace coarse to fine Gravel, with cobbles)**		moist
4		**S-2A**	12 8		FILL (same)	4'0"	Rec = 20"
5		**S-2B**	4 8		**Buried Topsoil, dark gray SILT some, coarse to fine Sand, trace fine roots**	5'0"	moist
6		**S-3**	11 14		Br cf S, l (+) $, s (-) cf G, w/cobbles		Rec = 14"
7			11 16				moist (tip wet)
8		**S-4**	8 7		same, l (+) cf G		Rec = 8"
9			6 8		**Brown coarse to fine SAND, little (+) Silt, some (-) coarse to fine Gravel, with cobbles [USCS: SM]**		wet
10		**S-5**	6 6				Rec = 13"
11			6 7		same, t mf G		wet
12							
13							
14							
15		**S-6**	29 50/3"		same, s $	15'0"	Rec = 14"
16					**End of Boring @ 15'0"**		wet Refusal on auger 15'0"
17							
18							
19							
20							
21							
22							

CARLIN-SIMPSON & ASSOCIATES Sayreville, NJ	TEST BORING LOG	BORING NUMBER B-2
Project: Proposed Lobby/Vestibule, 80 Franklin Ave, Pearl River NY		**SHEET NO.:** 1 of 1
Client: Lothrop Associates		**JOB NUMBER:** 24-07
Drilling Contractor: Environmental Technical Drilling		**ELEVATION:** -

GROUNDWATER					CASING	SAMPLE	CORE	TUBE	DATUM: -
DATE	TIME	DEPTH	CASING	TYPE	HSA	SS			START DATE: 22/Mar/24
22/Mar/24	1345	7'0"	HSA	DIA.	2 1/4"	1 3/8"			FINISH DATE: 22/Mar/24
				WGHT		140#			DRILLER: M. Kane
				FALL		30"			INSPECTOR: Kurt Anke

Depth (ft.)	Casing Blows per Foot	Sample Number	Blows on Sample Spoon per 6"	Sym	IDENTIFICATION		REMARKS
					Concrete slab with mesh	0'4"	
1							
			4		**FILL (Brown coarse to fine SAND,**		
2		S-1	8		**little Silt, trace medium to fine Gravel)**		Rec = 7"
			6		FILL (Br cf S, l $, t mf G)		moist
3			9			3'0"	
			2		**Buried Topsoil, dark gray SILT some,**		
4		S-2A	3		**coarse to fine Sand, trace fine roots**	4'0"	Rec = 14"
			8				moist
5		S-2B	10		Gr, br cf S, $, l (-) cf G		
			6				
6		S-3	8		same, mttld		Rec = 12"
			11				moist, tip wet
7			12				
			6				
8		S-4	7		Br cf S, l (+) $, t mf G		Rec = 12"
			6				wet
9			9		**Gray, brown coarse to fine SAND,**		
			6		**trace (-) Silt, little (-) coarse to fine**		
10		S-5	9		same **Gravel [USCS: SM]**		Rec = 8"
			8				wet
11			6				
			8				
12		S-6	7		same		Rec = 17"
			8				wet
13			12				
14							
			14				
15		S-7	25		Br cf S, s (-) $		Rec = 15"
			24				wet
16			39				
17						17'0"	Auger refusal 17'0"
					End of Boring @ 17'0"		
18							
19							
20							
21							
22							



GENERAL NOTES:

1. GENERAL LAYOUT WAS OBTAINED FROM A DRAWING PROVIDED BY LOTHROP ASSOCIATES ARCHITECTS D.P.C., MARKUP FOR GEOTECH/SOIL BORING RFP, DRAWING NO. A-110.
2. BORING LOCATIONS WERE LAID OUT IN THE FIELD BY CARLIN-SIMPSON & ASSOCIATES (CSA).
3. BORINGS WERE PERFORMED BY ENVIRONMENTAL TECHNICAL DRILLING INC. IN MARCH 2024 UNDER THE FULL TIME INSPECTION OF CSA.
4. LOCATIONS ARE APPROXIMATE.

LEGEND:

- BORING LOCATION

ROBERT B. SIMPSON, P.E.
PROFESSIONAL ENGINEER

BORING LOCATION PLAN

PROPOSED VESTIBULE
PEARL RIVER PUBLIC LIBRARY
80 FRANKLIN AVENUE
PEARL RIVER, NEW YORK

DRAWN	SCALE
MW	1" = 10'
CHECKED	DATE
RBS	04.22.2024
PROJECT NO.	DWG NO.
24-07	FIG -1
APPROVED	

CARLIN-SIMPSON AND ASSOCIATES, LLC
61 Main Street
Sayreville, NJ 08872

Consulting Geotechnical and Environmental Engineers

SECTION 990004
APPENDIX COVER 'D'

PEARL RIVER PUBLIC LIBRARY
80 Franklin Avenue
Pearl River, NY 10965

APPENDIX 'D'
PROJECT SPECIFICATIONS FOR ASBESTOS ABATEMENT AND DRAWINGS

END OF SECTION

PROJECT SPECIFICATION FOR ASBESTOS ABATEMENT

Client Contact:

Eugenia Schatoff
Pearl River Public Library.
50 Franklin Ave
Pearl River, NY 10603

Project Location:

Pearl River Public Library
50 Franklin Ave
Pearl River, NY 10603

Non-Destructive Surveys:

- Restrooms Renovation SED # 50-03-08-03-6-005-005
- Pearl River Public Library Renovation SED # 50-03-08-03-6-005-006

Asbestos Abatement Scope of Work:

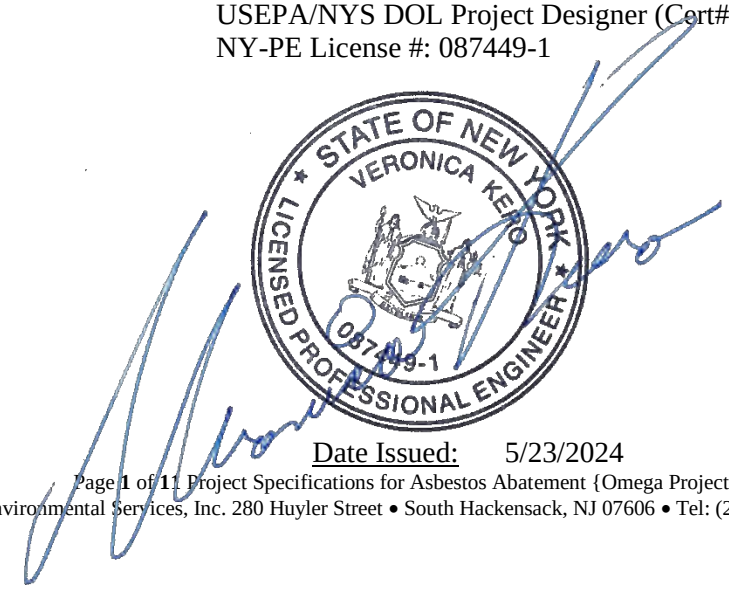
- ACM VAT/Mastic: approx. 5,500 sq. ft. (multiple layers)
- ACM Wall Tile Grout: approx. 50 sq. ft.
- ACM Door Insulation: approx. 24 sq. ft.
- Potential additional concealed ACM/PACM in un-surveyed bathroom wet wall risers/shafts.

{Abatement Contractor to coordinate probe cuts with GC to access concealed ACM/PACM and including contingency line item cost}

Project Designer(s) Information:

Drawing Preparation: Stan Blackman
Sr. Project Manager: Anton Rezin

Prepared by: Veronica Kero, CIH, P.E.
USEPA/NYS DOL Project Designer (Cert#: 91-00474)
NY-PE License #: 087449-1



Date Issued: 5/23/2024

Ω Omega Environmental Services, Inc. 280 Huyler Street • South Hackensack, NJ 07606 • Tel: (201) 489-8700 • Fax: (201) 342-5412

Table of Contents

Ω Omega Environmental Services, Inc. 280 Huyler Street • South Hackensack, NJ 07606 • Tel: (201) 489-8700 • Fax: (201) 342-5412

Article I. EXECUTIVE SUMMARY

Section 1.01 General

(a) This Project Specification was prepared by Omega Environmental Services Inc. (Omega) for Calgi Construction Company, Inc. who shall from this point in the documents be referred to as the Owner's Representative.

(b) This Project Specification was prepared and developed for specific use in Pear River Library for the removal of ACM to be impacted by the proposed renovation activities. Use of this document on any project except as described herein is prohibited unless prior written permission is obtained from Omega.

(c) No specific warranties or guarantees are made by Omega or its employees, as to the use of any information, product, apparatus, and/or process disclosed herein. Even though every reasonable effort has been employed by Omega personnel to assure that this document is correct, the Abatement Contractor shall bring all discrepancies to the immediate attention of Omega.

(d) The work described in this document shall comply with the general, supplementary, and other conditions included in the complete set of project documents.

(e) **Abatement Scope of Work (SOW) explained in this Project Specification is based on previous non-destructive asbestos survey information provided by Omega Environmental Services, Inc. and Environmental Consulting & Management Services.**

(f) **The Bathroom wet wall and riser/shaft(s) shown on the Project Demolition Drawings(s) were not yet opened for survey work. The Abatement Contractor shall coordinate probe cuts and/or selective demolition of these locations to inspect for concealed asbestos while the area is under containment and prior to the start of the demolition work.**

(g) Abatement Contractor is required to follow all relevant published Regulations and Codes (NYCDEP, NYCDOB, NYSDOL, NYSDEC, OSHA, EPA, etc.) pertaining to asbestos abatement in addition to project details outlined in this specification document.

(h) **Due to the size, scope, and scheduling of survey work when the building was occupied, the Omega survey team could not 100% verify all visible/concealed ACM. As such, it is the responsibility of the Abatement Contractor(s) in coordination with the General Contractor to assume that additional ACM or other material may be discovered during the construction and/or abatement phases. Specifically, when/if concealed asbestos risers, walls/ceiling/façade assemblies are to be opened for tie-ins and/or other scope details, additional asbestos survey work to be required. Add/deduct unit pricing to apply if quantities differential noted.**

Section 1.02 Primary Contacts

(a) Contact List

(i) **Client:**

Eugenia Schatoff
Pearl River Public Library
Phone #:
E-mail: prpldirector@rcls.og

(ii) **Owners Representative:**

David Chen
Calgi Construction Company Inc.
Phone #: (914) 682-9423 *ext. 102*
E-mail: dchen@calgiconstruction.com

(iii) **Omega Representative:**

Anton Rezin
Phone #: (201) 489-8700
E-mail: Antonr@omega-env.com
Note: Any technical question associated with this project specification should be addressed in writing or by email to Anton Rezin.

Article II. SUMMARY

Section 2.01 Project Description

(a) The Owner is planning a renovation project in the Pearl River Public Library, which requires the removal of asbestos containing material (ACM).

(b) This project shall be classified as a "Large" project in a Public type facility.

Section 2.02 Scope of Work

(a) Abatement Contract base bid work shall include removal of ACM utilizing procedures described in the table below.

Scope of Asbestos Abatement Work:

Abatement Contractor is responsible for verifying that all ACM (exposed and concealed) is removed from the SOW areas.

Table 1: Scope of Work Summary

Location(s)		Description of ACM Identified	Estimated Removal QTY	Abatement Procedure	Notes:
Floor	**Area**				
1st	Multiple Rooms/Offices	VAT/Mastic	5,500 sq. ft. *(multiple layers)*	NYSDOL Abatement Procedures & (small detached areas may be addressed using Tent Procedures)	Floor tile grinding required. Abatement Contractor to conduct additional probe cuts and/or selective demo in coordination with GC while the Bathroom is under containment to expose potential concealed TSI/ACM in wet walls. (*plumbing tie-in locations*)
	Men's/Women's Restroom	Wall Tile Grout	50 sq. ft		
	Entrance to MER	Door Insulation	24 sq. ft.		

Abatement Contractor is responsible for field verification of locations and the quantities of ACM including selective demolition as required to expose potential concealed ACM.

Section 2.03 Table Notes

(a) This Project falls under New York State jurisdiction, such that all abatement procedures and filings must performed in accordance with ***ICR 56 of Title 12 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (Cited as 12 NYCRR Part 56).***

(b) Abatement scope of work includes the removal of ACM in the Pear River Library, 1st floor multiple rooms & offices.

(c) Abatement Contractor is responsible for field verification of locations and the quantities of ACM. No change orders for extras shall be approved in the event the Abatement Contractor failed to verify the reported locations and quantities of ACM**.**

(d) Building personnel will not have access to the portions of the building in which the work is being performed during the asbestos removal operation, except for an emergency.

(e) A second emergency egress from each work area to be approved by the Owner/GC.

(f) Abatement Contractor will be responsible for all filing fees and variance.

(g) Abatement Contractor is responsible for 24/7 fire watch during abatement (*if required).*

(h) **Abatement Contractor is responsible for the removal of all ACM VAT/mastic, wall tile grout, and door insulation delineated in the asbestos abatement SOW area (as well as any concealed ACM).**

(i) Abatement Contractor to remove any ACM VAT/mastic extending under partition walls (see demo drawings for walls scheduled to be demolished).

(j) **After Abatement Contractor removes ACM grout tile wall and backer, concealed wet wall, risers, and shafts to be checked for additional asbestos pipe insulation (ACM/TSI).**

(k) **For bidding purposes, assume a concealed quantity of 50-100 LF at up to five additional locations, where add/deduct pricing is to apply once final ACM quantities reconciled.**

(l) Abatement work must be conducted in strict accordance with Owner & Calgi Construction schedule.

(m) Abatement Contractor to coordinate with the Owner & Calgi Construction for the exact AFD exhaust locations to the outside.

(n) **Building to remain vacant during the abatement period.**

(o) **Owner will be responsible for re-locating all contents in the abatement work area prior to the onset of abatement activities, (disturbance of asbestos floor VAT/mastic not permitted).**

(p) Prior to the start of any prep work, the Owners Licensed Electricians, Plumbers, and other Tradesman shall lockout/tag-out existing systems utilities where disconnects are available outside the work area.

(q) In the event of a schedule change request (i.e. double shifts, weekend work, holiday work, etc.), both the Owner and Omega must be notified in writing 48 hours prior and approved by the notified parties.

(r) Abatement Contractor shall not be permitted to traverse adjacent occupied areas/building, routing to be coordinated with Owner.

Section 2.04 Filings, Procedures & Regulations

A. This Project falls under New York State jurisdiction, such that all abatement procedures and filings must performed in accordance with ***ICR 56 of Title 12 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (Cited as 12 NYCRR Part 56)***

(a) **Abatement Contractor shall follow all of the Owners policies and procedures, in addition to OSHA, Local, EPA, and NYSDOL rules/regulations pertaining to asbestos abatement.**

(b) Abatement Contractor will be responsible for providing all NYSDOL filing fees. In addition to state filings/notifications, which shall be handled by the Abatement Contractor.

(c) All provisions of State of New York Department of Labor, (DOL) Asbestos Regulations Industrial Code Rule 56.

(d) U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA):
- Asbestos Regulations: Title 29, Part 1910, of the Code of Federal Regulations.
- Respiratory Protection: Title 29, Part 1910, Section 134 of the Code of Federal Regulations.
- Construction Industry: Title 29, Part 1926, of the Code of Federal Regulations.
  Access to Employee Exposure & Medical Records: Title 29, Part 1910, Section 20 of the Code of Federal Regulations.
- Hazard Communication: Title 29, Part 1910, Section 1200 of the Code of Federal Regulations.
- Specifications for Accident Prevention Signs and Tags: Title 29, Part 1910, Section 145 of the Code of Federal Regulations.

(e) U.S. Environmental Protection Agency (EPA)
- 40 CFR Part 763
- 40 CFR Part 61

(f) New York State Department of Environmental Conservation (DEC) Regulations regarding waste collection registration. Title 6, Part 364 of the New York State Official Compilation of Codes, Rules, and Regulations – 6NYCRR 364.

(g) NYSDOH Title 10 Part 73 – Asbestos Safety Program and Environmental Laboratory Approval Program.

Section 2.05 Applicable Standards:

A. Applicable standards include, but are not limited to, the following:

a. Environmental Protection Agency (EPA)
Region II
Air and Hazardous Materials Division
Federal Building, Room 802
26 Federal Plaza
New York, NY 10007

b. Occupational Safety & Health Admin. (OSHA)
US Dept. of Labor
1515 Broadway/Room 3445
New York, NY 10036
[asbestos, lead, fall protection, electrical, etc.]

c. State of NY Dept. of Environmental Conservation
Division of Solid Waste Management
50 Wolf Road
Albany, NY 11202

d. NYS Dept. of Labor (DOL)
Asbestos Control Program
One Hudson Square, 75 Varick Street (7th Floor)
New York, NY 10013

e. American National Standards Institute (ANSI)

1430 Broadway
New York, NY 10018

B. The Contractor has the responsibility of informing his/her personnel and the Owner of the requirements of these agencies and shall satisfy completely these specifications and all referenced regulations, and as amended.

Section 2.06 Occupant Safety

(a) Abatement Contractors shall not generate excess levels of noise, dust, or other nuisance hazards such that occupants cannot perform their normal work routine especially if the space above the work area involves sensitive health care operations. Abatement Contractor shall not damage elevators or other building services such that the spaces cannot be utilized by the occupants. Abatement Contractors shall not damage flooring or other finishes in non-construction areas.

(b) Neighboring Spaces/Building:

(i) While the abatement area shall be non-occupied during abatement, adjacent spaces/buildings may be partially occupied and operational.

Section 2.07 Scheduling & Labor

(a) Anticipated project schedule: **Spring/Summer 2025.**

(b) The official Start date must be approved by the Owner. The Abatement Contractor shall be responsible for notifying Omega Environmental of the official start date prior to permits being issued.

(c) All schedule changes must be approved by Owner prior to onset of work.

(d) Special schedule requirements: **TBD.**

(e) The asbestos Abatement Contractor should utilize multiple crews such that overtime premium labor rates do not apply.

(f) Times and shifts will be coordinated during the mandatory pre-bid walkthrough meeting.

Section 2.08 Project-Specific Details:

(a) Abatement Details:

(i) **Full Containment(s) expected to be staged in one large quantity contiguous work area(s) with additional tent enclosures for small/minor quantity removal areas. Grinding of ACM mastic shall be conducted in full containment only. No usage of chemicals is permitted in the building.**

(ii) Manual method(s) to be utilized throughout the abatement phase(s), except for the mastic grinding.

(iii) Abatement area(s) shall be 100% asbestos free for current SOW at completion of abatement project

(iv) Abatement Contractor may not block/prop open any fire-rated doors during abatement, as it would cause an unnecessary fire hazard

(v) Abatement Contractor to report any cabinetry or furniture blocking of ACM material so that items can be removed by the Owner.

(vi) Expected decon staging locations(s).

Article III. UTILITIES HOOK-UP

Section 3.01 Water Service:

(a) Temporary Water Service Connection: All connections to the Owners water system shall include backflow prevention. After completion of use connections and fittings shall be removed without damage or alteration to existing water piping and equipment. Leaking fittings/valves shall be repaired and/or replaced as required.

(b) Water Hoses: Use heavy-duty abrasion-resistant hoses with a pressure rating greater than the maximum pressure of the water distribution system to provide water into each work area and to each decon.

(c) Water Heater: Provide UL rated 40-gallon electric water heaters to supply hot water for the personal decontamination shower. Drip pans shall be at least 6" deep and securely fastened to the water heater.

Section 3.02 Electrical Service:

(a) Temporary Power: Provide service to decon sub-panel with a minimum 100 AMP, 2-pole circuit breaker or fused disconnect connected to the building's main distribution panel. Sub-panel and disconnect shall be sized and equipped to accommodate all electrical equipment required for the completion of work.

(b) Temporary Lighting: Abatement Contractor shall provide adequate lighting to ensure proper workmanship.

(c) Ground Fault Protection: Equip all circuits with ground fault circuit interrupters. Locate panel outside containment.

(d) Wiring: Provide circuits of adequate size and proper characteristics for each use.

(e) Extension Cords: Use only grounded heavy-duty extension cords in single lengths.

Article IV. WASTE REMOVAL

Section 4.01 Removal & Storage:

(a) **Asbestos Waste Container with Owner/GC approval to be utilized for this project.**

(b) All routes through the building to be used for transportation of waste shall be protected to avoid contamination and damage. If abatement waste routes utilize elevators, the Abatement Contractor shall be responsible for protection of the elevators during waste bag out and all phases of this project.

(c) ACM shall be packaged and sealed in leak-proof containers according to the following:

(i) The Abatement Contractor shall double-bag all waste material utilizing 6 mil. polyethylene bags which should not be overfilled. Air inside the bags shall be evacuated with the HEPA vacuum. The top of the bags shall be twisted and tied in order to achieve a seal.

(ii) Contamination material with sharp edges (metal lather, ductwork, ceiling grid, etc.) shall be cut to size and placed in plastic-lined boxes which are subsequently bagged.

(iii) All bags shall be marked with pre-printed labels as prescribed in Section 61.150 of the EPA regulations, OSHA regulations, and DOT regulations.

(d) All waste shall be transported through the building (in enclosed carts) according to the route specified

(e) At no time shall random removal of waste from the work area be allowed;

(f) No material shall be dropped inside the work area;

(g) No asbestos waste bags shall be stored on-site. A waste pick-up must be scheduled by the Abatement Contractor at the conclusion of each shift.

(h) The work site and all access routes shall be cleaned daily by the Abatement Contractor

Section 4.02 Transportation & Disposal:

(a) Asbestos container location to be approved by Owner.

(b) All ACM, ACM-wastes, and plastic, disposable equipment, and supplies shall be disposed of as contaminated waste in accordance with EPA NESHAPS regulations.

(c) Each asbestos waste bag shall be labeled individually with Generator ID as required which shall be inspected by the Project Monitor.

PLAN VIEW

ASBESTOS ABATEMENT WORK PLAN

Pearl River Public Library
50 Franklin Ave
Pearl River, NY 10603
(1st Floor Phased Asbestos Abatement Project)

Non-Destructive Surveys:

- Restrooms Renovation SED # 50-03-08-03-6-005-005
- Pearl River Public Library Renovation SED # 50-03-08-03-6-005-006

Approximate Asbestos Abatement Scope of Work:

Base Bid SOW:

- ACM VAT/Mastic: approx. 5,500 sq. ft. (multiple layer)
- ACM Wall Tile Grout: approx. 50 sq. ft.
- ACM Door Insulation: approx. 24 sq. ft.
- Potential additional concealed ACM/PACM in un-surveyed bathroom wet wall risers/shafts.

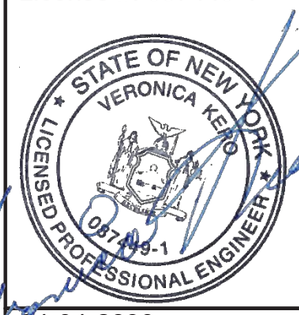
{Abatement Contractor to coordinate probe cuts with GC to access concealed ACM/PACM and including contingency line item cost}

CLIENT:
Eugenia Schatoff
Pearl River Public Library.
50 Franklin Avenue
Pearl River, NY 10603

SITE:
Pear River Public Library
50 Franklin Avenue
Pearl River, NY 10603

CONSULTANT:
Omega Env. Services
280 Huyler Street
S Hackensack, NJ07606
Tel: (201) 489-8700
Fax: (201) 342-5412

Project Designer:
Veronica Kero
License #: 91-00474
Professional Engineer:
Veronica Kero
License #: 087449-1



24-04-2830

REVISION

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ASBESTOS LOCATION PLAN: Cover Page

DWG: 00.00

OMEGA ENVIRONMENTAL SERVICES, INC

PLAN VIEW

NOT TO SCALE

Table 1: Scope of Work Summary

Location(s)		Description of ACM Identified	Estimated Removal QTY	Abatement Procedure	Notes:
Floor	Area				
1st	Multiple Rooms/Offices	VAT/Mastic	5,500 sq. ft. *(multiple layers)*	NYSDOL Abatement Procedures & (small detached areas may be addressed using Tent Procedures)	Floor tile grinding required. Abatement Contractor to conduct additional probe cuts and/or selective demo in coordination with GC while the Bathroom is under containment to expose potential concealed TSI/ACM in wet walls. *(plumbing tie-in locations)*
	Men's/Women's Restroom	Wall Tile Grout	50 sq. ft.		
	Entrance to MER	Door Insulation	24 sq. ft.		

LEGEND:

- ACM VAT/Mastic (*multiple layers*)
- ACM Door Insulation
- ACM Wall Tile Grout
- Remote Worker Decon(s) and Work Area Perimeter
- AL — Airlock

Abatement Notes:

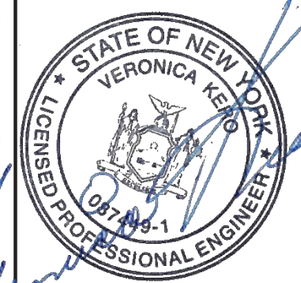
1. This Project falls under New York State jurisdiction, such that all abatement procedures and filings must performed in accordance with ICR 56 of Title 12 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (Cited as 12 NYCRR Part 56).
2. Abatement scope of work includes the removal of ACM in the Pear River Library, 1st floor multiple rooms & offices.
3. Abatement Contractor is responsible for field verification of locations and the quantities of ACM. No change orders for extras shall be approved in the event the Abatement Contractor failed to verify the reported locations and quantities of ACM.
4. Building personnel will not have access to the portions of the building in which the work is being performed during the asbestos removal operation, except for an emergency.
5. A second emergency egress from each work area to be approved by the Owner/GC.
6. Abatement Contractor will be responsible for all filing fees and variance.
7. Abatement Contractor is responsible for 24/7 fire watch during abatement (if required).
8. Abatement Contractor is responsible for the removal of all ACM VAT/mastic, wall tile grout, and door insulation delineated in the asbestos abatement SOW area (as well as any concealed ACM).
9. Abatement Contractor to remove any ACM VAT/mastic extending under partition walls (see demo drawings for walls scheduled to be demolished).
10. After Abatement Contractor removes ACM grout tile wall and backer, concealed wet wall, risers, and shafts to be checked for additional asbestos pipe insulation (ACM/TSI).
11. For bidding purposes, assume a concealed quantity of 50-100 LF at up to five additional locations, where add/deduct pricing is to apply once final ACM quantities reconciled.
12. Abatement work must be conducted in strict accordance with Owner & Calgi Construction schedule.
13. Abatement Contractor to coordinate with the Owner & Calgi Construction for the exact AFD exhaust locations to the outside.
14. Building to remain vacant during the abatement period.
15. Owner will be responsible for re-locating all contents in the abatement work areas prior to the onset of abatement activities, (disturbance of asbestos floor VAT/mastic not permitted).
16. Prior to the start of any prep work, the Owners Licensed Electricians, Plumbers, and other Tradesman shall lockout/tag-out existing systems utilities where disconnects are available outside the work area.
17. In the event of a schedule change request (i.e. double shifts, weekend work, holiday work, etc.), both the Owner and Omega must be notified in writing 48 hours prior and approved by the notified parties.
18. Abatement Contractor shall not be permitted to traverse adjacent occupied areas/building, routing to be coordinated with Owner.

CLIENT:
Eugenia Schatoff
Pearl River Public Library.
50 Franklin Avenue
Pearl River, NY 10603

SITE:
Pear River Public Library
50 Franklin Avenue
Pearl River, NY 10603

CONSULTANT:
Omega Env. Services
280 Huyler Street
S Hackensack, NJ07606
Tel: (201) 489-8700
Fax: (201) 342-5412

Project Designer:
Veronica Kero
License #: 91-00474
Professional Engineer:
Veronica Kero
License #: 087449-1



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ABATEMENT LOCATION PLAN: 1ST FLOOR - SCOPE OF WORK

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OMEGA ENVIRONMENTAL SERVICES, INC

SECTION 990004
APPENDIX COVER 'D'

PEARL RIVER PUBLIC LIBRARY

80 Franklin Avenue
Pearl River, NY 10965

APPENDIX 'E'

ROOF ASSMBLY LETTER AND TAPERED INSULATION LAYOUT

END OF SECTION

October 3, 2024 Revised - March 10, 2025

Attn: COASTAL SPECIFIED PRODUCTS
1 ENTERPRISE PLACE
HICKSVILLE, NY 11801-5347

Re: Pearl River Public Library
Pearl River, NY

To Whom It May Concern:

This letter shall acknowledge that the following Carlisle roofing system is considered for warranty by Carlisle SynTec Systems. In accordance with ANSI/FM 4474, the assembly listed is tested for a 150-PSF uplift rating. Submitted for inclusion with this letter, are project specific uplift pressures that the roof system is to resist.

Zone 1= -30.5 PSF; Zone 2= -51.1 PSF; Zone 3= -77 PSF

Building Height:	Approximately 40-feet tall.
Membrane:	60-mil Sure-Seal® EPDM membrane adhered with CAV-GRIP™ III Low-VOC Adhesive.
Cover Board:	1/2" SecurShield™ HD Plus [4'x 8' boards] mechanically fastened with 24 Carlisle InsulFast™ fasteners and 3" insulation plates in the field, perimeter and corners.
Insulation:	Tapered with minimum 1.5-inch thickness InsulBase® Polyisocyanurate insulation loose laid.
Deck:	22-gauge steel or heavier deck.

The roofing assembly described herein, represents Carlisle's minimum warranty requirements. It is not intended to modify, negate or alter any requirements dictated by the specifier or mandated by the building code or the building owner's insurer. Carlisle's review and inspection are strictly for the purpose of issuing the Carlisle warranty.

System enhancements pertaining, but not limited, to membrane thickness, insulation type and thickness, flashing height, slope requirements and membrane terminations [beyond those required by Carlisle] are to be complied with when specified unless approved by the Architect / Consultant. These conditions are considered above and beyond the scope of Carlisle review and take precedence.

Upon final inspection and acceptance by a Carlisle Field Service Representative confirming that the roof system has been installed in accordance with Carlisle Specifications, Carlisle will issue a 20-year warranty with 120-MPH wind speed coverage. Unless purchased or supplied through Carlisle, please note that performance, integrity, and impact of products by others is not included under coverage of the Carlisle Warranty.

If you have any question or need any additional information, feel free to contact our office.

Sincerely,

Melinda Barbour
Design Analyst
Carlisle SynTec Systems

Cc: Kerry Brooks, Kevin Hourahan, Frank Trimboli

1 ENTERPRISE PL HICKSVILLE, NY 11801-5347
Phone: (516) 733-2900
Fax: (516) 932-0334

Tapered System - Revision #4

Project Information

Project Name	Pearl River Public Library Replacements	**Filing Number**	F24-34260
Owner Name	Ramapo Catskill Library System	**Quote ID**	Q250318-152
Address	80 Franklin Ave	**Quote Date**	03/18/2025
City	PEARL RIVER	**Expires**	Todays price subject to change without notice
State	NY	**Bid Date**	10/08/2024 10:21 AM
County	Rockland	**Published By**	Chad Rieder
Branch	Hicksville NY 380		chad.rieder@becn.com

Tapered Insul-Takeoff

Specifications

Manufacturer	N/A
Insulation	20psi Polyiso
Design	Designed per the architectural plans or as close as possible
Additional Information	N/A
Addenda	N/A
Estimator	Chad Rieder, (862) 274-5315, chad.rieder@becn.com

F24-34260-R4-All Sections — $37,000.00

Area of Tapered	281.52 Sq	Area of Crickets	1.85 Sq
Minimum Thickness	0.50"	Minimum Thickness	0.50"
Maximum Thickness	5.09"	Maximum Thickness	1.94"
Total Applied	321.40 Sq	Avg R-Value	8.37
Total Handled	467.36 Sq		
Truckload Qty*	1.77		

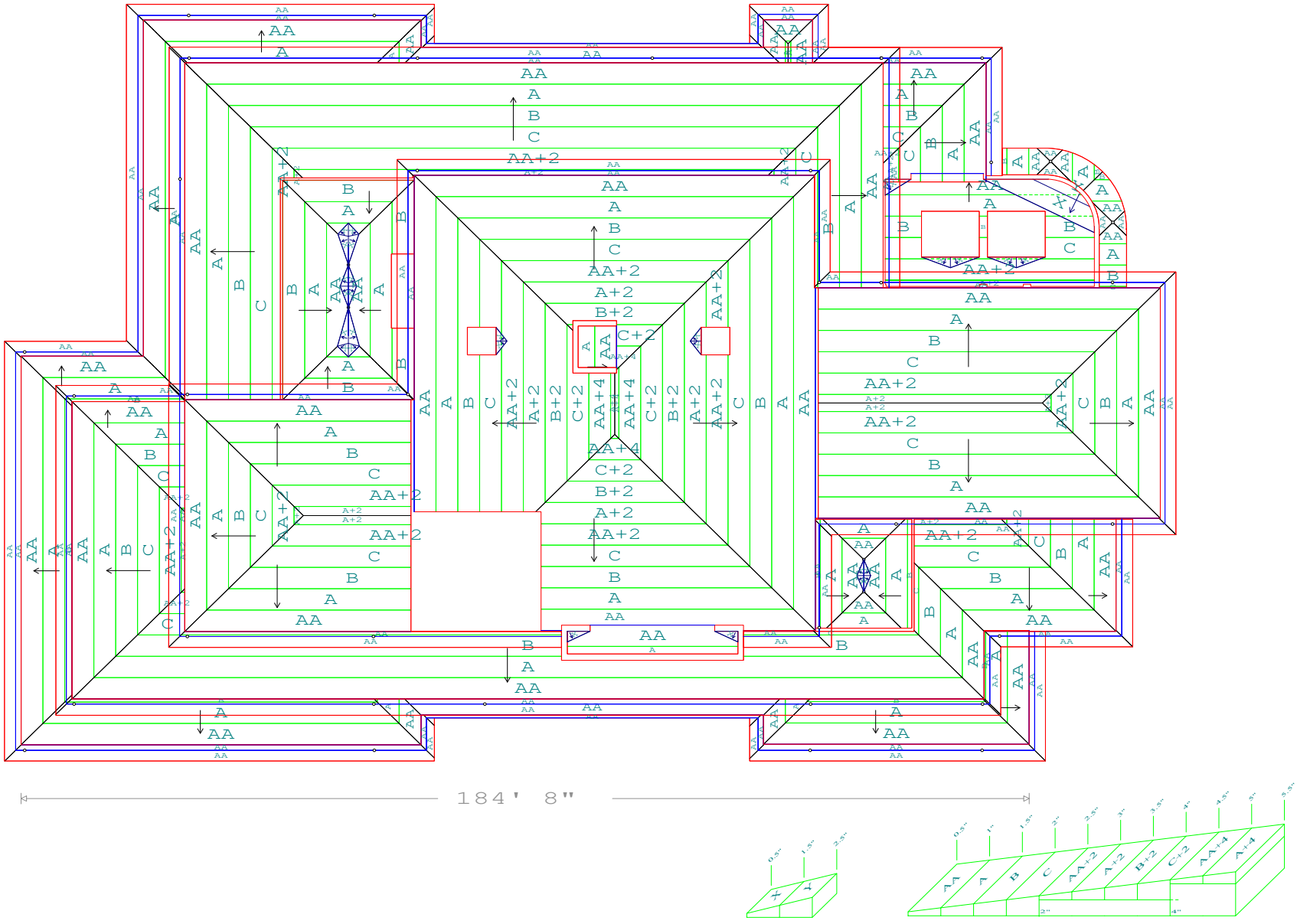
* Based on 44 (4x4) pallets per truckload

Products

Type	Description	Slope/LF	Thickness
Tapered	4.0 X 4.0 POLYISO 20 PSI TAPERED	1/8	
Fill	4.0 X 4.0 POLYISO 20 PSI FLAT		2"
Cricket Tapered	4.0 X 4.0 POLYISO 20 PSI TAPERED	1/4	

Notes

- 1) SQ BY AREA MUST BE VERIFIED BY CONTRACTOR BEFORE SHIPMENT.
- 2) QUOTE IS SUBJECT TO CONTRACTOR/ARCHITECT APPROVAL.
- 3) ADD SPECIFIED BASE LAYER SEPARATELY AS REQUIRED.
- 4) ADD SPECIFIED OVERLAY SEPARATELY AS REQUIRED.
- 5) SUMP MATERIAL IS INCLUDED IN QUOTE.



IMPORTANT NOTE- The dimension listed and areas shown on this Thumbnail represent our interpretation ofthe Tapered Insulation requirements for this project. It is the contractor's responsibility to verify that the actual project dimensions and areas identified are consistent with our interpretation. Pleasecontact the Tapered Designer listed on this quote ASAP if any inconsistencies are discovered.

BEACON ENGINEERING	Project: Pearl River Public Library Re	Job Number: F24-34260-R4

Quote Disclaimer/Notes

- Please be advised that pending tariffs could inordinately increase domestic costs on imported products and Beacon can only honor a manufacturer's quote to the same extent that the manufacturer honors its quote to Beacon.
- Where project pricing is based on full truckload quantities; warehouse orders cannot be sold at the full truck price.
- All quotes are subject to freight, material / fuel surcharges, hazmat fees, and deficit freight fees for partial truck shipments.
- Quantities and materials listed are based on our interpretation of the project; it is the customer’s responsibility to review all plans and specs for accuracy.
- Listed quantities are estimates only, Beacon Building Products will not be responsible for overages or shortages on the quantities provided.
- Non-stock and special order material cannot be returned to a Beacon facility.
- Please reference the project quote # when placing an order for this project.

SECTION 990004
APPENDIX COVER 'D'

PEARL RIVER PUBLIC LIBRARY

80 Franklin Avenue
Pearl River, NY 10965

APPENDIX 'F'

BUILDING PERMIT

END OF SECTION

THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234

Office of Facilities Planning
Room 1060 Education Building Annex
89 Washington Ave.
Albany, NY 12234
Tel: (518) 474-3906
Email: emscfp@nysed.gov
Website: www.nysed.gov/facplan

BUILDING PERMIT

ISSUED PURSUANT TO APPROVAL OF PLANS AND SPECIFICATIONS FOR THE PROJECT BELOW:

PERMIT NO.: 23-2137 **DATE ISSUED:** 01/03/24

DISTRICT: Pearl River UFSD

BUILDING: Pearl River Public Library

ADDRESS: 80 Franklin Ave

Pearl River, N.Y. 10965

(POST IN CONSPICUOUS PLACE ON PREMISES OF WORKSITE)

THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234

Office of Facilities Planning
Room 1060 Education Building Annex
89 Washington Ave.
Albany, NY 12234
Tel: (518) 474-3906
Email: emscfp@nysed.gov
Website: www.nysed.gov/facplan

January 13, 2025

Mr. Marco Pochinesta
Superintendent
Pearl River UFSD
275 E. Central Ave.
Pearl River, N.Y. 10965

CERTIFICATE OF APPROVAL OF PLANS AND SPECIFICATIONS

Building: Pearl River Public Library

Facilities Planning Project Control Number

5	0	0	3	0	8	0	3	6	0	0	5	0	0	6	2	3	2	1	3	7	0	1	0	3	2	4
District BEDS Code								Facility Code				Project No.			Review Number						Approval Date					

Plans and specifications for the project listed above have been duly reviewed by the Office of Facilities Planning and are hereby approved. The district may bid these plans and specifications as approved or as modified by any addenda subsequently approved by Facilities Planning for this project. Approved Plans and Specifications are retained by the Office of Facilities Planning for three (3) years. The school district must obtain a duplicate set of plans and specifications, including all addenda, from their architect or engineer of record for permanent retention with this approval letter.

Commissioner's approval signifies only that plans and specifications meet the requirements of Sections 408 and 409 of the Education Law, and Commissioner's Regulations and Education Department policies and procedures relating to educational requirements, heating, ventilation and health, and fire and accident protection, and that the site meets the minimum requirements of Section 408. It does not signify approval of architectural or structural design, nor choice of building materials, nor of any contracts which may be awarded or executed, nor of any features which go beyond the aforesaid minimum requirements, nor does this certificate give assurance that this project qualifies for State aid for education, in accordance with the provisions of Section 3602 of the Education Law.

Please note that courts have held that schools are not wholly immune or fully exempt from all municipal zoning regulations. As such, it is suggested that schools consult with their attorneys and with local municipalities to address any potential local zoning issues.

During Construction - Supervision by the architect or engineer (A/E) during construction is required by Subdivision 3 of Section 7209 of the Education Law and includes ensuring that construction work is in accordance with the construction contract documents. Detailed Supervision Guidelines describing the elements of this on-site supervision are available on the Office of Facilities

Planning web site.

Construction Inspections – Title 19 (NYCRR) Chapter 32, Part 1203, paragraph 1203.3b mandates construction inspections at such times as will permit the observation of the foundation, and building elements and utilities prior to final inspection. The purpose of such inspections is to ensure work in accordance with the construction contract documents and compliance with the Building Code of New York State. Therefore, it is incumbent on the A/E to make such periodic observations as are necessary for the A/E to execute the Certification of Substantial Completion Form (see below).

To assist in developing essential records of the construction inspection activities, two different forms are attached: #1, a Capital Project Inspection Report for each individual inspection (reproduce necessary additional copies) and #2, a Capital Project Summary of Inspections. These forms (or something essentially equivalent) shall be delivered by the A/E to the school district at the time of Substantial Completion and shall be retained by the district as part of the official project record, available for review by the Commissioner on request.

Certification of Substantial Completion - When the construction work is nearing completion, the Architect/Engineer (A/E) (who is supervising the construction work pursuant to the provisions of Subdivision 3 of Section 7209 of the Education Law) must execute a "Partial Certification of Substantial Completion", form FP-PCSC, or a "Final Certification of Substantial Completion", form FP-FCSC, when it is appropriate to do so. A copy of each form is enclosed. Carefully retain these documents for future use.

Note that "Substantial Completion" is a specific condition at a specific time. Definitions of the American Institute of Architects (AIA), The National Society of Professional Engineers, The American Consulting Engineers Council, and the Construction Specification Institute are essentially the same. The AIA definition is, "The date of substantial completion of work or designated portion thereof is the date certified by the architect when construction is sufficiently complete, in accordance with the contract documents, so the owner can occupy or utilize the work or designated portion thereof for the use for which it is intended."

Assurances - Various assurances are printed on the reverse side of Form FP-CSC. The A/E shall sign those assurances relating to change orders; supervision pursuant to Education Law, Section 7209 and the contract with the school district; and construction inspections pursuant to Title 19 (NYCRR) Chapter 32, Part 1203, paragraph 1203.3b.

The Superintendent of Schools shall sign those assurances relating to proper monitoring of the project by a Construction Manager (if any); and a Clerk of the Works (if any) pursuant to contracts with the school district, (the usual duties of a Construction Manager and Clerk of the Works are included in the detailed Supervision Guidelines referenced above); and (if applicable) acknowledgement of the need of a Certificate of Occupancy prior to occupancy of any new building or addition (if applicable). In the case of reconstruction projects, Final Certification of Substantial Completion, form FP-FCSC, should not be submitted until the entire project is substantially complete (i.e., there should be no qualifications on the form). In the case of a new building or an addition, where parts of a project may be occupied initially, use Partial Certification of Substantial Completion, form FP-PCSC and designate which portions of the project are not substantially complete. Subsequently occupied portions shall be certified when substantially complete. Final Certification of Substantial Completion, form FP-FCSC must be submitted when the entire project is substantially complete.

Fire Safety Inspection and Report - A fire safety inspection and report thereof is required for new buildings and additions. Immediately subsequent to the determination by the A/E that the work is substantially complete for the use of which it is intended, the school district shall cause a fire/safety inspection to be made of the whole occupied portion of the building. This inspection shall use the Fire Safety Report form. The Fire Safety Report form is available on the Office of Facilities Planning web site. If you have questions about completing this form please call the Fire/Safety Unit at (518) 474-3906. Carefully retain the form until needed at the time of substantial completion. See "Occupancy", below.

Occupancy - No building or portion thereof shall be occupied unless a valid Certificate of Occupancy (CO) has been issued by the Commissioner (Commissioner's Regulation 155.8(e). To obtain a CO, send either a Partial Certification of Substantial Completion (form FP-PCSC) if a portion of the new space is being occupied, or a Final Certification of Substantial Completion (form FP-FCSC) if the entire new space is being occupied, together with the Fire/Safety Report form, to the Office of Facilities Planning. Upon submission of a satisfactory Fire/Safety Report, a Certificate of Occupancy will be issued which will "bridge" to the date of the regular annual fire/safety inspection process. In the case of occupancy of an addition, if the "Building Project" Fire Safety Report and the annual Fire Safety Report are due at essentially the same time, contact your project manager.

Final Building Project Report - A Final Building Project Report is required for every project for which a building permit is issued.

A copy of the Final Building Project Report form is available on the Office of Facilities Planning web site at www.p12.nysed.gov/facplan/ under Finance/QZAB/QSCB, Final Cost Report Workbook. All sources of funds and expenditures, regardless of cost, shall be reported, however, the report must not be filed until all bills are paid and the capital account has been closed.

Record the Project Control Number on the top of the form and return it directly to the State Aid Office soon after the construction work is complete and paid for.

If this project involves both additions and alterations, expenses must be submitted under each of these categories. Building aid eligibility, as determined pursuant to Section 3602 of the Education Law, is calculated separately for additions and for alterations. Careful attention to submitting the report with proper breakdown will eliminate much delay and confusion in processing building aid applications and will assure that the district receives proper allocation of building aid.

Sincerely,

Betty A. Rosa
Commissioner of Education

THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234

Office of Facilities Planning
Room 1060 Education Building Annex
89 Washington Ave.
Albany, NY 12234
Tel: (518) 474-3906
Email: emscfp@nysed.gov
Website: www.nysed.gov/facplan

BOND CERTIFICATE

I do hereby certify that I have caused the records of this Department to be examined, and it appears therefrom that the plans and specifications for the construction project identified below have been approved by the Commissioner of Education as complying with the provisions of the Education Law.

Name of District: Pearl River UFSD

County of District: Rockland

Name of Building: Pearl River Public Library

Facilities Planning Project Control Number

5	0	0	3	0	8	0	3	6	0	0	5	0	0	6	2	3	2	1	3	7	0	1	0	3	2	4
District BEDS Code								Facility Code				Project No.			Review Number						Approval Date					

PLEASE USE THIS NUMBER in all correspondence to the State Education Department concerning this project.

Betty A. Rosa
Commissioner of Education

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FP-CSC
2003

CERTIFICATION OF SUBSTANTIAL COMPLETION

A school district capital construction project approved by the Commissioner of Education shall be constructed in accordance with plans and specifications which incorporate applicable provisions of the New York State Uniform Fire Prevention and Building Code, the New York State Energy Conservation Construction Code, and Education Department construction standards.

At the time of Substantial Completion of a project, the architect or engineer and superintendent of schools shall execute three (3) copies of this form including the assurances on the reverse side. Distribution: Facilities Planning, School District, Architect or Engineer.

1. Name of District: Pearl River UFSD
2. County of District: Rockland
3. Name of Building: Pearl River Public Library

Facilities Planning Project Control Number

5	0	0	3	0	8	0	3	6	0	0	5	0	0	6	2	3	2	1	3	7	0	1	0	3	2	4
District BEDS Code								Facility Code				Project No.			Review Number						Approval Date					

I, the undersigned [Architect] [Engineer] certify on the basis of an inspection _____ [date] that work performed on this project, except portions thereof designated below, has been reviewed and found to be substantially complete, and that the Date of Substantial Completion of the Project, as defined below, is _____.

Definition: Date of Substantial Completion of the Project, is the date certified by the architect or engineer when the construction is substantially complete in accordance with the Contract Documents so the school district can occupy or utilize the project, except designated portions thereof, for the use for which it is intended.

Seal of Architect or Engineer

Signature _____
☐ [Architect] ☐ [Engineer]

Firm _____

Address _____

_____

Date _____ Phone _____

In the case of a new building or addition(s) use space below to designate specific portions of the project which are NOT included in this certification. Submit subsequent certification(s) when any of these portions are adjudged to be substantially complete.

-OVER-

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Assurances by Architect or Engineer

The undersigned architect or engineer makes the following assurances:

1) This public works project has been supervised pursuant to Subdivision 3 of Section 7209 of the Education Law and pursuant to contract with the school district for professional services.

2) Construction inspections pursuant to 19NYCRR444.3d have been performed on this project. Records for each individual inspection and a complete report of all individual inspections have been delivered to the school district.

3) All change orders on this project have been submitted to the Commissioner for review.

Date: _____ Signature: _____

☐ Architect ☐ Engineer

.....

Assurances of Superintendent of Schools

The undersigned superintendent of schools makes the following assurances:

1) In the case of the project having a Clerk of the Works, the Clerk of the Works (Name) _____, has properly monitored the project pursuant to contract with the school district for services.

2) In the case of the project having a Construction Manager, the Construction Manager (Name) _____, has properly monitored the project pursuant to contract with the school district for services.

3) In the case of a new building or addition, the need of a Certificate of Occupancy prior to occupancy or used is acknowledged.

4) If none of the above are applicable, check here: ☐

Date: _____ Signature: _____

THE UNIVERSITY OF THE STATE OF NEW YORK
New York State Education Department
Facilities and Management Services
Room 1060 – Education Building Annex
Albany, NY 12234

FP-FI/03

REQUEST FOR REVISION OF FINANCIAL INFORMATION (Use This Form to Revise SA-4)

- Use this form when it is necessary to request a revision of the financial information previously submitted to Facilities Planning on the Application for Examination and Approval of Final Plans and Specifications (Form FP-F), such as immediately after construction contracts are signed or when the Final Building Expenditure Report for the project is filed.
- Each request that increases the total amount allocated to a particular project must be accompanied by proof of authorization of funding for that project.
- Please read the instructions on the back of this form before completing it.

1. Name of District: Pearl River UFSD
2. County of District: Rockland
3. Name (or type) of building: Pearl River Public Library
4. Facilities Planning Project Control Number

5	0	0	3	0	8	0	3	6	0	0	5	0	0	6	2	3	2	1	3	7	0	1	0	3	2	4
District BEDS Code								Facility Code				Project No.			Review Number						Approval Date					

Amounts of larger bond issue or line item:

14,350,000 Bonds	3,984,934 Budget Appropriation	05/16/23 Date of Orig. Authorization
0 Capital Reserve	0 Other	_____ Date of Supplemental Authorization

METHOD OF FINANCING

	COLUMN A	COLUMN B	COLUMN C
1. Bonds/BANS/Capital Notes	14,350,000		
2. Budgetary Appropriation	3,984,934		
3. Capital Reserve Fund	0		
4a. Other (specify)	0		
4b. Other (specify)	0		
4c. Other (specify)	0		
TOTAL FINANCING (Total of Items 1-4)	18,334,934		

PROJECT COSTS

	COLUMN A	COLUMN B	COLUMN C
5. Construction (New Building/Addition)	0		
6. Construction (Alteration/Reconstruction)	15,845,109		
7. Incidental (New Building/Addition)	0		
8. Incidental (Alteration/Reconstruction)	2,489,825		
9. Total (New Building/Addition)	0		
10. Total (Alteration/Reconstruction)	18,334,934		
TOTAL PROJECT (Total of Items 5-10)	18,334,934		

5. _____ Contact person for Question Regarding this Form **(PLEASE PRINT)** ( ) _____ Phone Number

6. _____ **PRINT:** President, Board of Education _____ Signature of Board President _____ Date

7. _____ **PRINT:** Superintendent of Schools _____ Signature of Superintendent _____ Date

FOR EDUCATION DEPARTMENT USE ONLY:

Approved by: _____ Date: _____

Instructions

A. General

Two copies of this form, properly executed, shall be submitted to the Facilities Planning when the total of approved sources of funds must be increased to be equal to, or greater than, expenditures for the project.

This circumstance may not occur at all, but could occur on a maximum of two occasions: 1) When Form SA-139 is submitted to the Division of Finance immediately subsequent to signing construction contracts, and/or 2) When the Final Building Project Report is sent to Facilities Planning.

B. Relating to filing Form SA-139, Request for Building Data, with the General Aids and Services Office:

1) This Request for Revision of Financial Information shall be submitted prior to submitting form SA-139:

   a) If the total project cost to be reported on the SA-139 exceeds the sum of lines 1-4, which are reported on the form SA-4, and/or
   b) If there is any change in the method(s) or amount(s) of financing as reported on form SA-4.

2) The total project costs cannot legally exceed the approved authorization. Any additional funds required must be properly authorized by the voters of a non-city district or the board of education of a city district.

   Each necessary additional authorization shall be properly documented. This documentation shall be a copy of the board resolution if a city district, or, if a non-city district, a copy of the actual language of the resolution which was placed before the voters at a special referendum; or a copy of the Popular Budget, and a copy of the SBM-1, if the approval occurred at the annual meeting.

C. Relating to filing the Final Building Project Report to Facilities Planning at the completion of the work.

1) A Request for Revision of Financial Information shall be submitted together with the Final Building Project Report:

   a) If the Grand Total of revenues (line "v" of page 21 of the Final Building Project Report) is less than the Grand Total of expenses (line "u" of page 22), and/or
   b) If there is any change in the method(s) or amount(s) of financing as reported on form SA-4 (See A, above).

2) Each necessary additional authorization shall be properly documented. This documentation shall be a copy of the board of resolution if a city district; or, if a non-city district, a copy of the actual language of the resolution which was placed before the voters at a special referendum; or a copy of the Popular Budget, and a copy of the SBM-1, if the approval occurred at the annual meeting.

D. Instructions for Completing Items #1 through #6 and Column A, B, and C: (Copy the information exactly as it appeared on the SA-4, which was sent to the district at the beginning of the project).

#1, #2, #3	--	Record the district's popular name, county of location, and name of building being reported.
#4	--	Enter the 27-digit number which appears as item #4 on forms SA-4.
Column A	--	Record the amounts on lines #1 - #12 exactly as they appear on the SA-4.
Column B	--	Items #1 – 5: Report new and/or additional methods of financing by entering the appropriate dollar amounts which are being added.
	--	Items #6 - 12: Report new project costs by entering the appropriate dollar amounts which are being added.
Column C	--	Items #1 – 12: Enter the new totals obtained by adding the figures in Column A and Column B.
#5	--	Enter the name and telephone number of the person in the district that should be contacted concerning questions about this project.
#6	--	The President of the Board of Education and Superintendent of Schools must sign and date this form

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CAPITAL PROJECT SUMMARY OF INSPECTION

Facilities Planning Project Control Number

5	0	0	3	0	8	0	3	6	0	0	5	0	0	6	2	3	2	1	3	7	0	1	0	3	2	4
District BEDS Code						Facility Code			Project No.			Review Number			Approval Date												

School District: Pearl River UFSD

Project Name: Pearl River Public Library, Additions and Alterations

List the dates of each individual inspection below.

Retain this report on file as part of the official project record, and available for review by the Commissioner on request.

☐ foundations --- dates: _____

_____

☐ structural elements -- dates: _____

_____

☐ electrical inspections -- dates: _____

_____

☐ heating, ventilation and air conditions systems -- dates: _____

_____

☐ plumbing systems -- dates: _____

_____

☐ fire protection and detection systems -- dates: _____

_____

☐ exiting features -- dates: _____

_____

☐ other (describe) -- dates: _____

☐ other (describe) -- dates: _____

☐ other (describe) -- dates: _____

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CAPITAL PROJECT INSPECTION REPORT

Facilities Planning Project Control Number

5	0	0	3	0	8	0	3	6	0	0	5	0	0	6	2	3	2	1	3	7	0	1	0	3	2	4
District BEDS Code								Facility Code				Project No.			Review Number						Approval Date					

School District: Pearl River UFSD

Project Name: Pearl River Public Library, Additions and Alterations

Date of Inspection:

Retain this report on file as part of the official project record, and available for review by the Commissioner on request.

Type(s) of Inspection (check all that apply):

☐ foundations

☐ plumbing systems

☐ structural elements

☐ fire protection and detection

☐ electrical systems

☐ exiting features

☐ heating, ventilation, air conditioning systems

☐ other

Comments: Note all discrepancies or nonconformances to code. Also note final disposition of each.

Name and Title of Inspector:

Signature of Inspector:

Date:

Photo Book
2021-2024

VOLUME 1

Lothrop Associates Architects D.P.C.

Pearl River
Public Library

Photo Book
2021-2024

December 2014 - EXTERIOR

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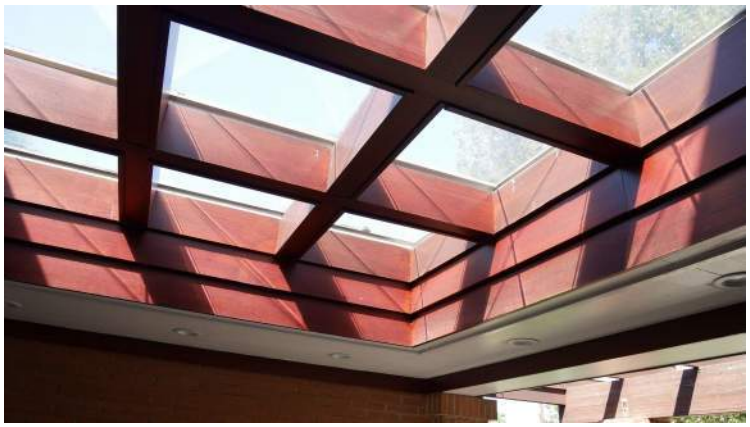

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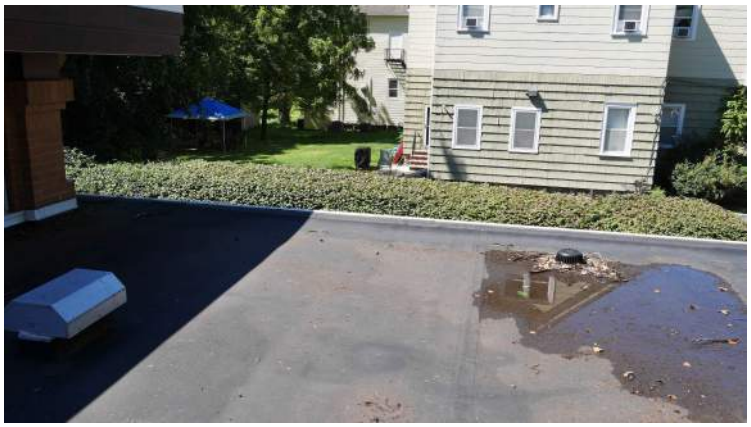

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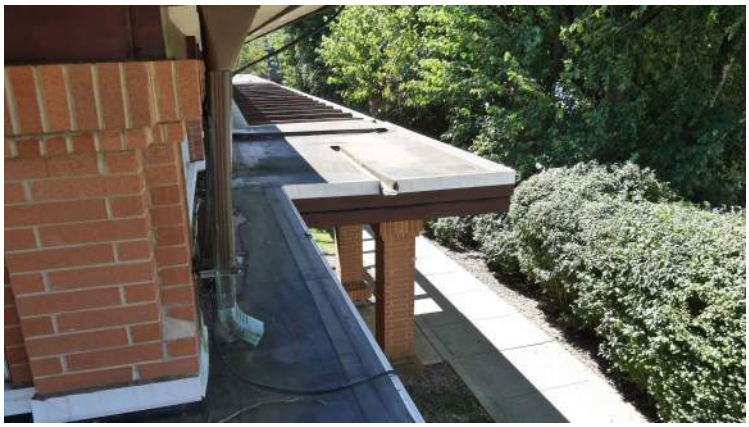

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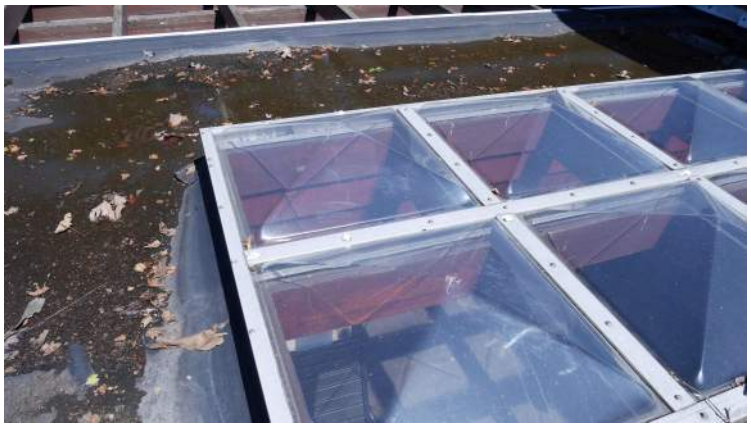

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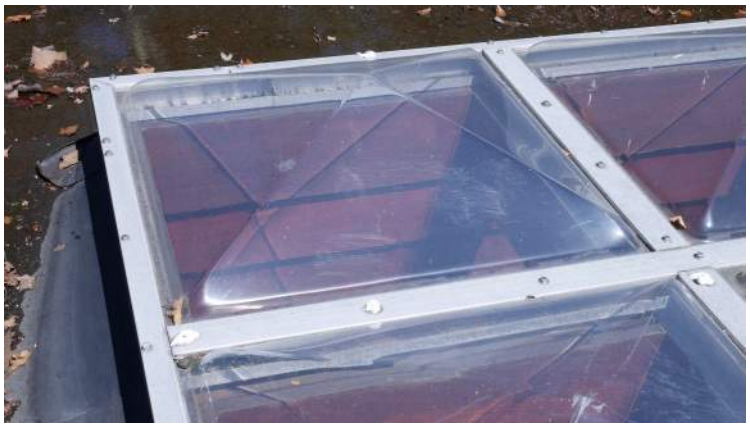

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2021-2024

MECHANICAL+ROOF

Lothrop Associates Architects D.P.C.

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VESTIBULE

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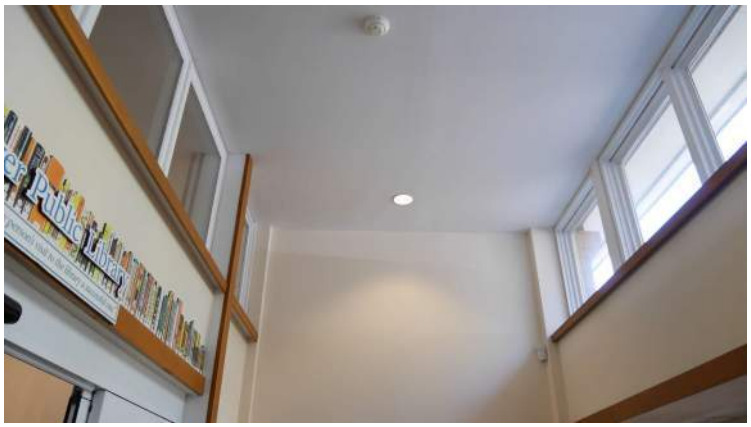

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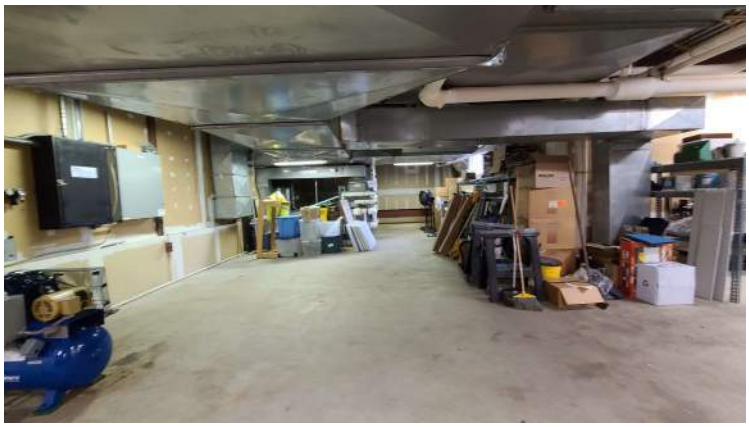
2021-2024

MECHANCIAL
October 2021

Lothrop Associates Architects D.P.C.



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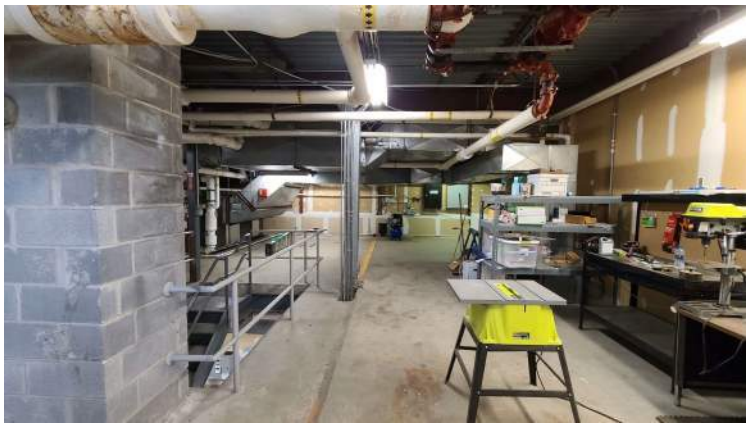

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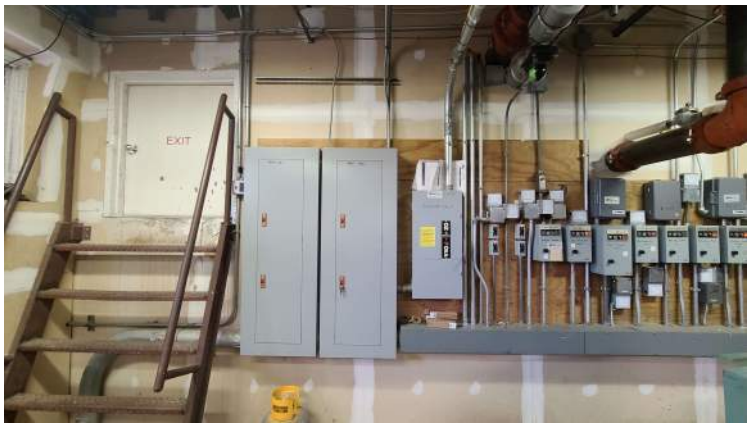

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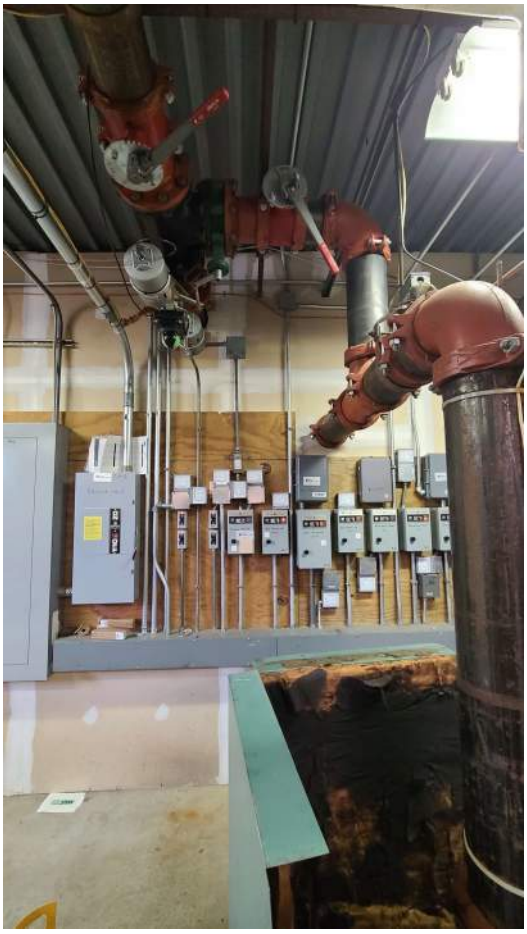

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2578-02_21_1029 - CHIMNEY (BG) (6101).JPG

2578-02_21_1029 - CHIMNEY (BG) (6103).JPG

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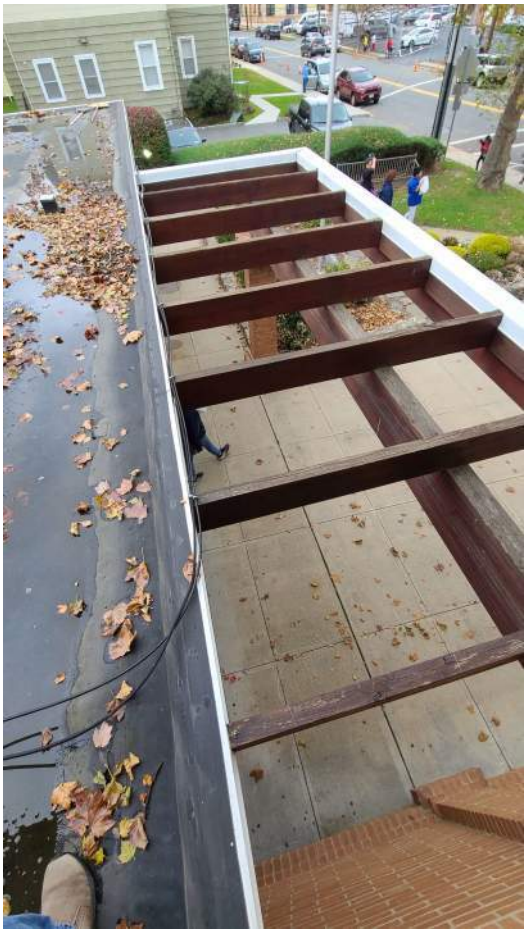

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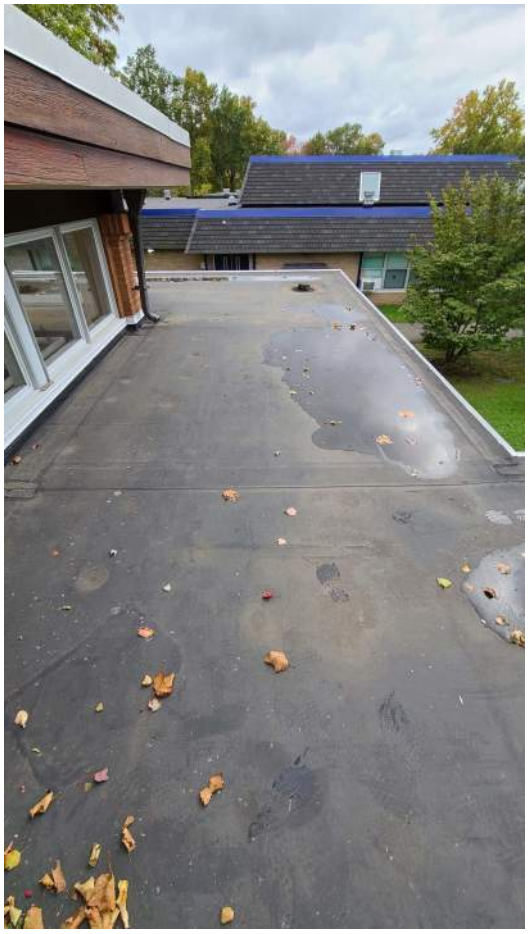

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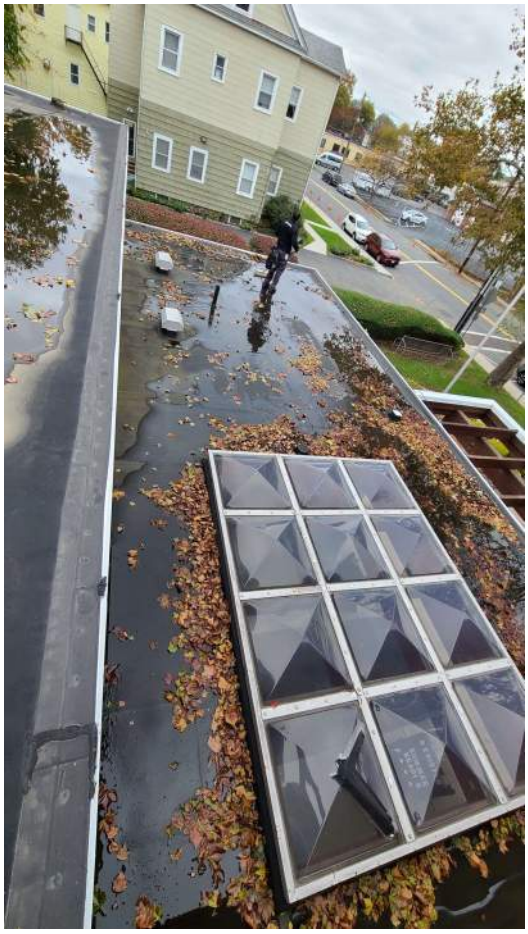

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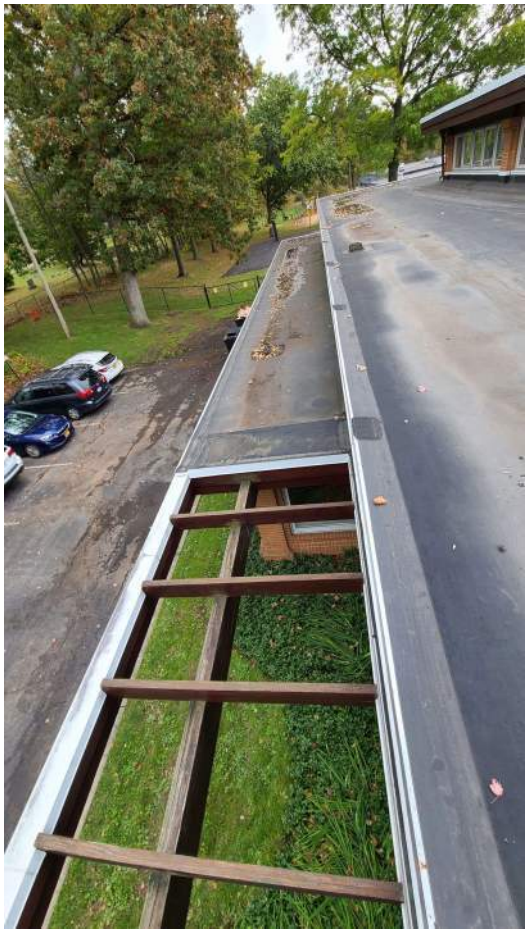

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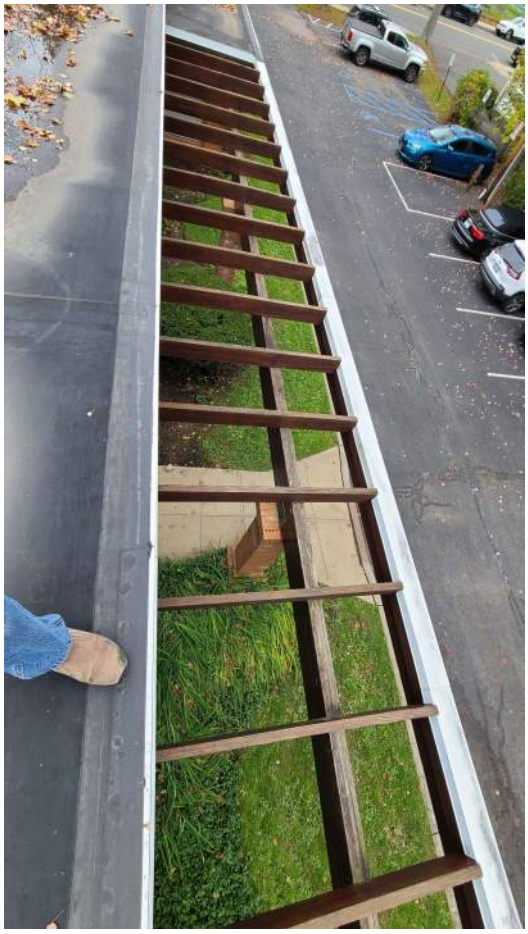

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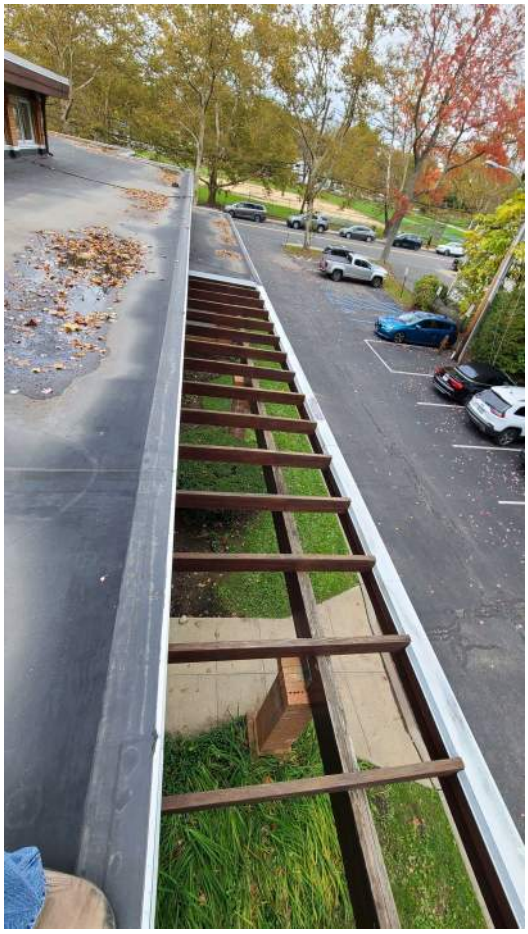

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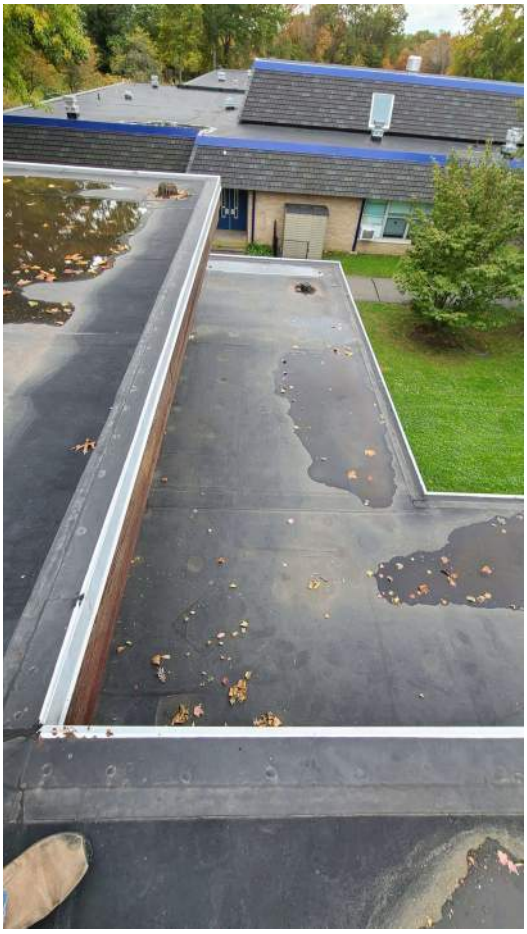

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2578-02_21_1029 - MID LEVEL ROOF (BG) (6110).JPG

2578-02_21_1029 - PHOTOGRAPHS (5168).JPG

2578-02_21_1029 - PHOTOGRAPHS (5179).JPG

2578-02_21_1029 - PHOTOGRAPHS (5178).JPG

2578-02_21_1029 - PHOTOGRAPHS (5187).JPG

2578-02_21_1029 - PHOTOGRAPHS (5188).JPG

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2578-02_21_1029 - PHOTOGRAPHS (5197).JPG

2578-02_21_1029 - ROOF (L) - 6118.JPG

2578-02_21_1029 - ROOF (M) - 5100.JPG

2578-02_21_1029 - ROOF (M) - 5167.JPG

2578-02_21_1029 - ROOF (M) - 5115.JPG

2578-02_21_1029 - ROOF (M) - 5198.JPG

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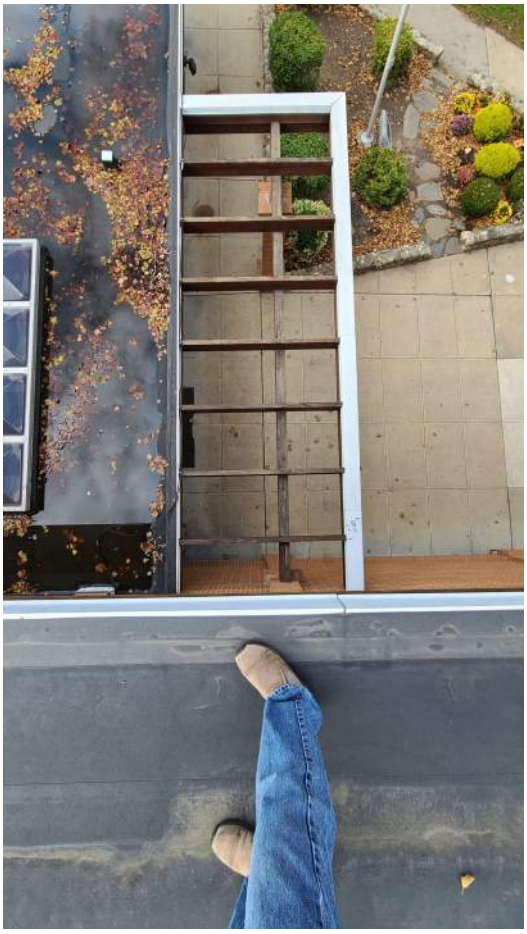

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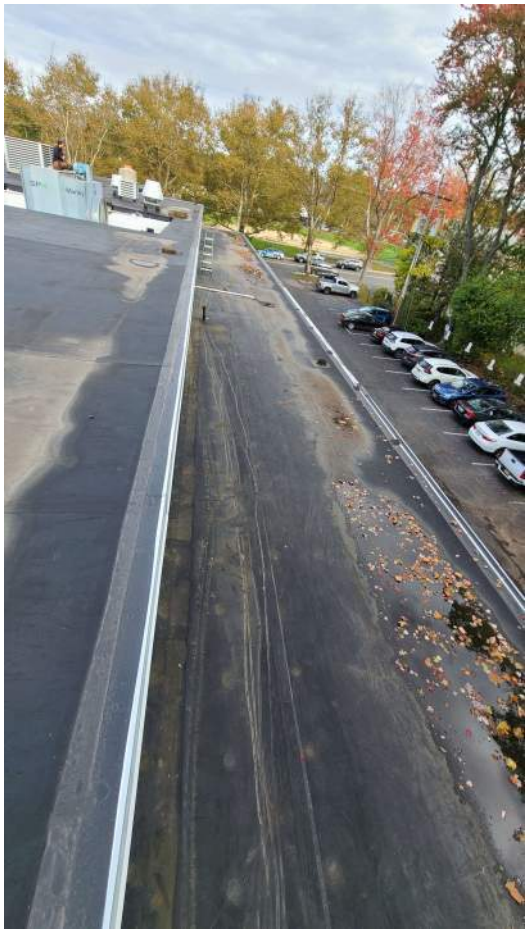

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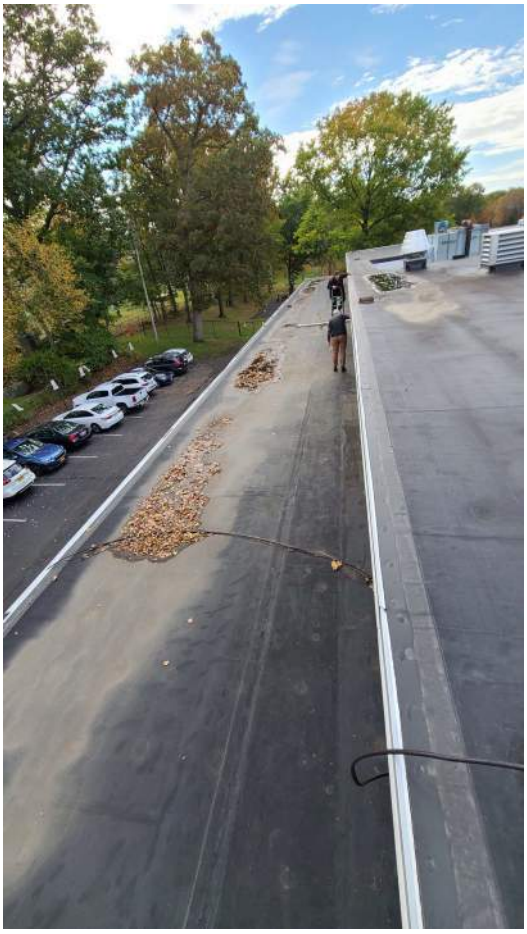

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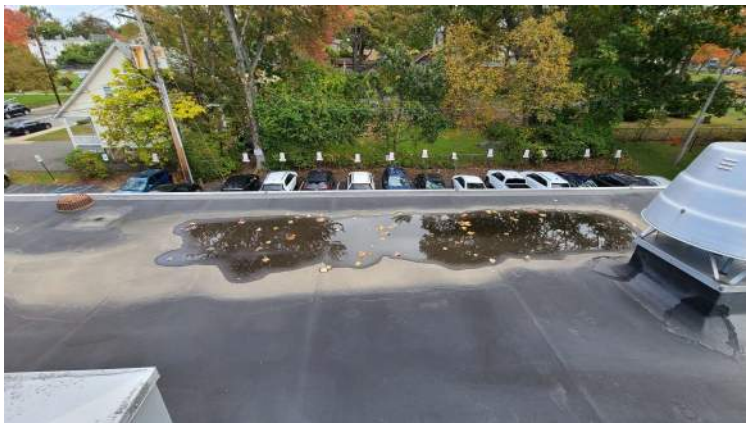

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2021-2024

MECHANICAL
JANUARY 2022

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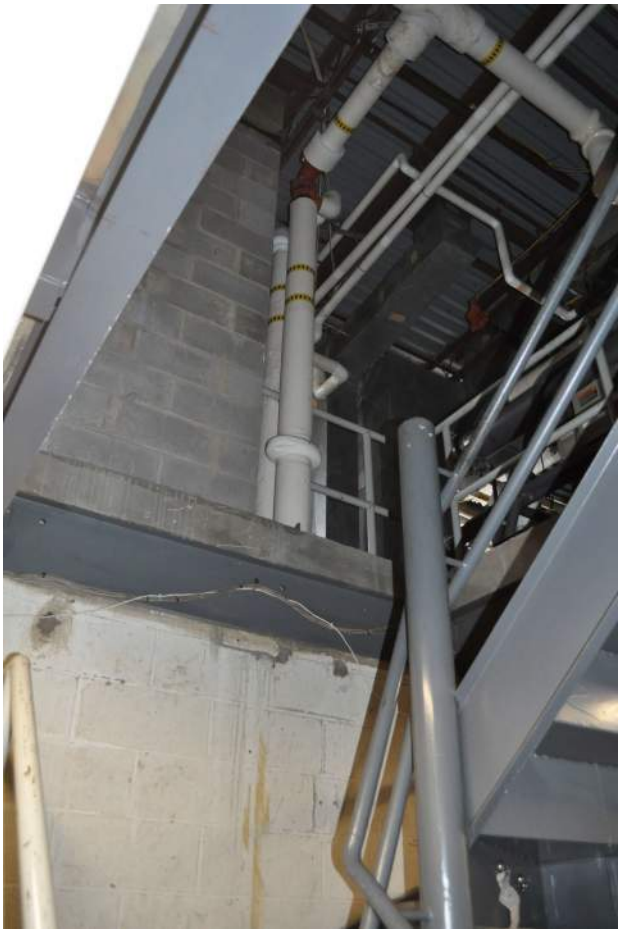
2578-02_22_0125 - AS PHOTO (6146).JPG



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2578-02_22_0125 - AS PHOTO (6159).JPG

Pearl River
Public Library

Photo Book
2021-2024

PROBES
MARCH 2022

Lothrop Associates Architects D.P.C.

2578-02_22_0321 - PROBES (6427).JPG

2578-02_22_0321 - PROBES (6448).JPG

2578-02_22_0321 - PROBES (6440).JPG

2578-02_22_0321 - PROBES (6645).JPG

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2021-2024

EXTERIOR AND ROOF
NOVEMBER 2022

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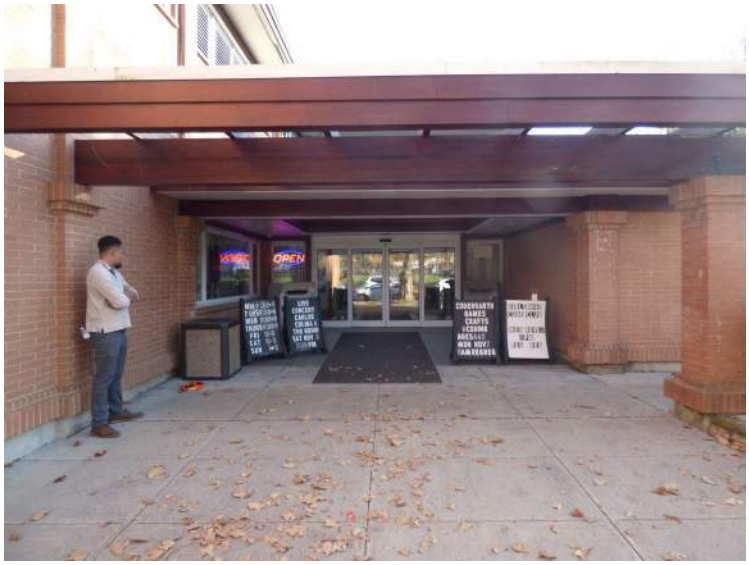

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2578-02_22_1103 - EC PHOTOS - ELEVATIONS (JS) (6416).JPG

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2578-02_22_1103 - EC PHOTOS - ROOF (JS) (6446).JPG

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Photo Book
2021-2024

PHOTOS
NOVEMBER 2022

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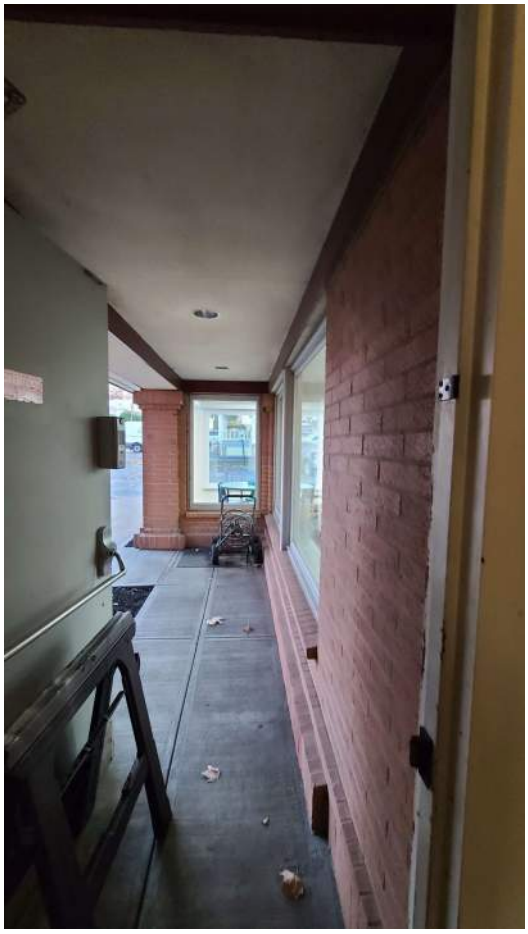

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Pearl River
Public Library

Photo Book
2021-2024

EXTERIOR
JANUARY 2023

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2578-02_23_0105 - EXTERIOR (KS) (4001).JPG

2578-02_23_0105 - EXTERIOR (KS) (4034).JPG

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Photo Book
2021-2024

MECHANCIAL
JANUARY 2023

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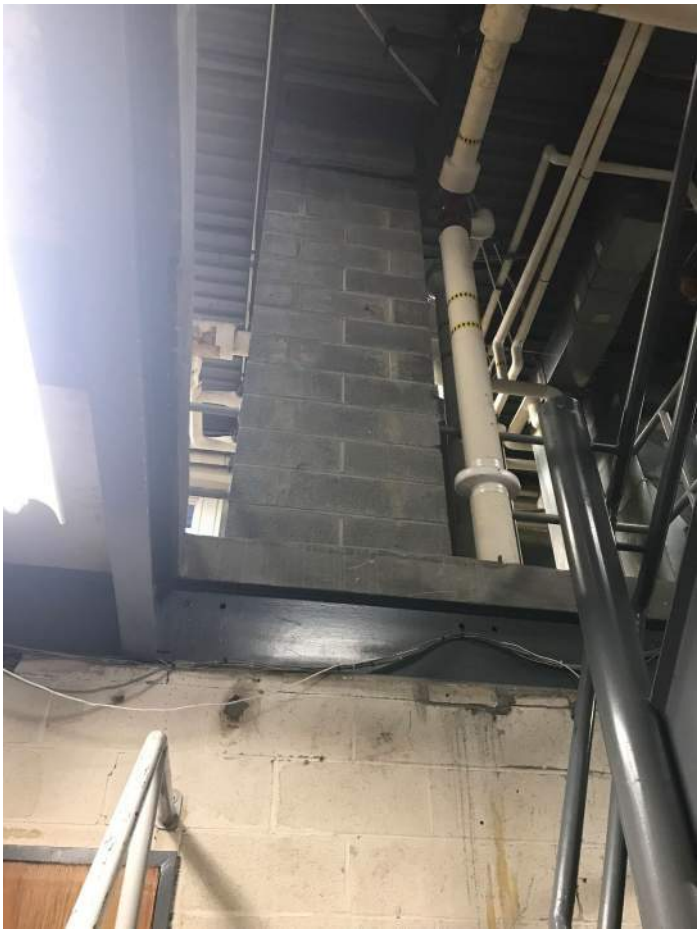

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2578-02_23_0111 - MECH - 6518 (2).JPG

2578-02_23_0111 - MECH - 6520.JPG

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2578-02_23_0111 - MECH - 6525.JPG

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2578-02_23_0111 - MECH - 6527.JPG

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Photo Book
2021-2024

PROBES AND PLENUMS
AUGUST 2023

Lothrop Associates Architects D.P.C.

2578-02_23_0811 - NORTH - 6703.JPG

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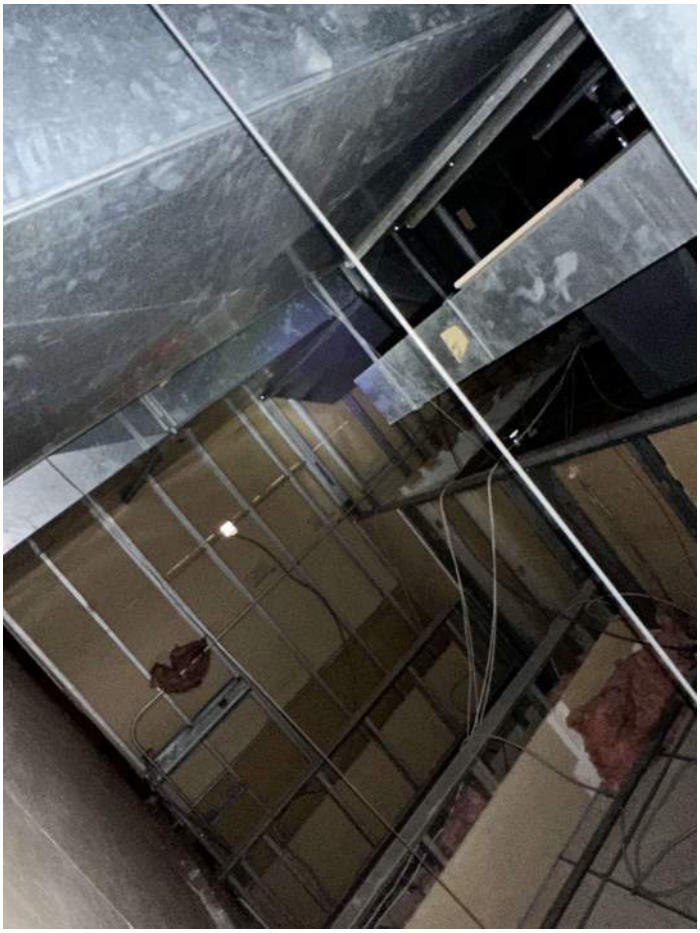
2578-02_23_0811 - PROBE AHU3 - 6707 (2).JPG



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2578-02_23_0811 - PROBE BEHIND AHU3 (6709).JPG

Pearl River
Public Library

Photo Book
2021-2024

ABOVE COMMUNICAITONS ROOM AND ENTRY
AUGUST 2023

Lothrop Associates Architects D.P.C.

2578-02_23_0823 - VOID ABOVE COMM RM - 6801 (2).JPG

2578-02_23_0823 - VOID ABOVE COMM RM ENTRY (BG) (6802).JPG

2578-02_23_0823 - VOID ABOVE COMM RM ENTRY (BG) (6801).JPG

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2578-02_23_0823 - VOID ABOVE COMM RM ENTRY (BG) (6805).JPG

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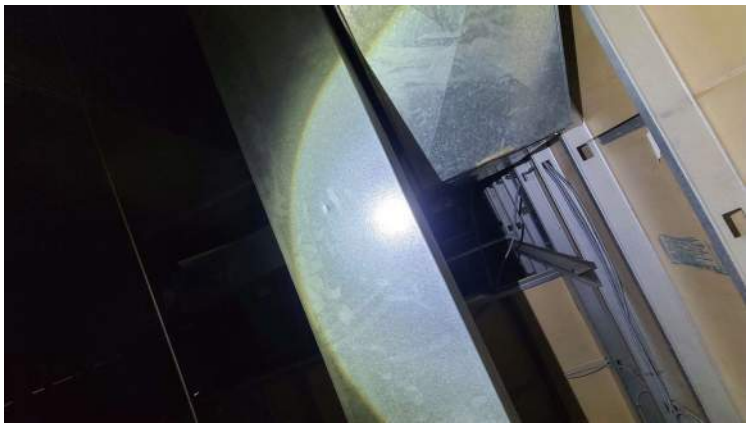

2578-02_23_0823 - VOID ABOVE COMM RM ENTRY (BG) (6808).JPG

2578-02_23_0823 - VOID ABOVE COMM RM ENTRY (BG) (6810).JPG

2578-02_23_0823 - VOID ABOVE COMM RM ENTRY (BG) (6809).JPG

Pearl River
Public Library

Photo Book
2021-2024

DAMAGED BRICK
AUGUST 2023

Lothrop Associates Architects D.P.C.

2578-02_23_0825 - BRICK EVAL (JP+DS) (6902).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6905).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6904).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6906).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6907).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6909).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6908).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6910).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6911).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6913).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6912).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6914).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6915).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6917).JPG

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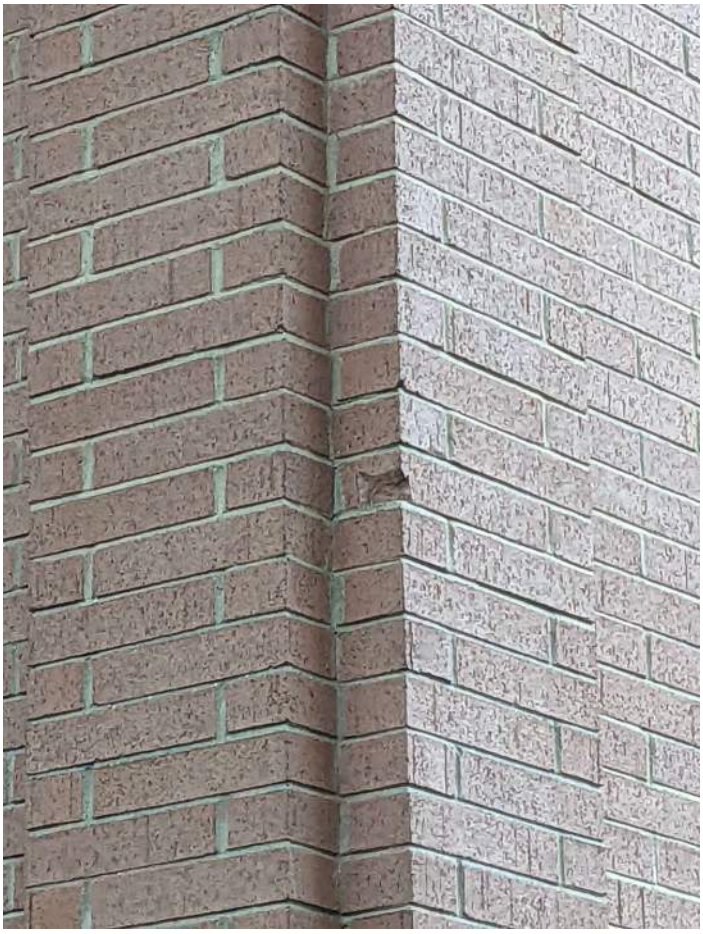
2578-02_23_0825 - BRICK EVAL (JP+DS) (6918).JPG



2578-02_23_0825 - BRICK EVAL (JP+DS) (6919).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6921).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6920).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6922).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6923).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6926).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6924).JPG

2578-02_23_0825 - BRICK EVAL (JP+DS) (6927).JPG

2578-02_23_0825 - EAST - 6903.JPG

2578-02_23_0825 - WEST - 6901.JPG

2578-02_23_0825 - SOUTH - 6925.JPG

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2021-2024

ENTRY
SEPTEMBER 2023

Lothrop Associates Architects D.P.C.

2578-02_23_0908 - 7008 - ENTRY.JPG

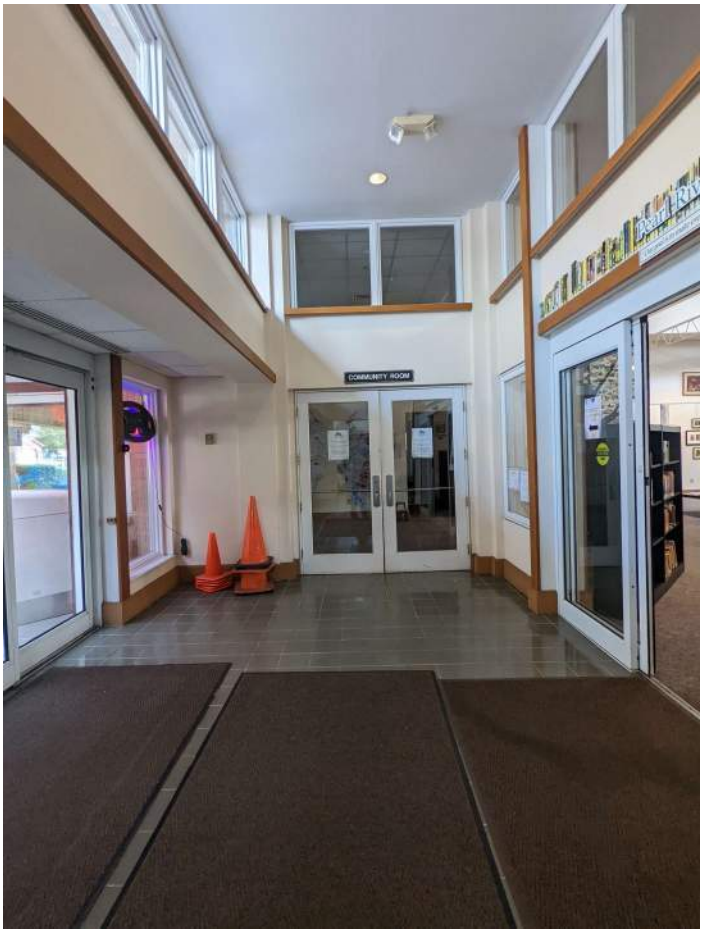
2578-02_23_0908 - 7010 - ENTRY.JPG

2578-02_23_0908 - 7009 - ENTRY.JPG

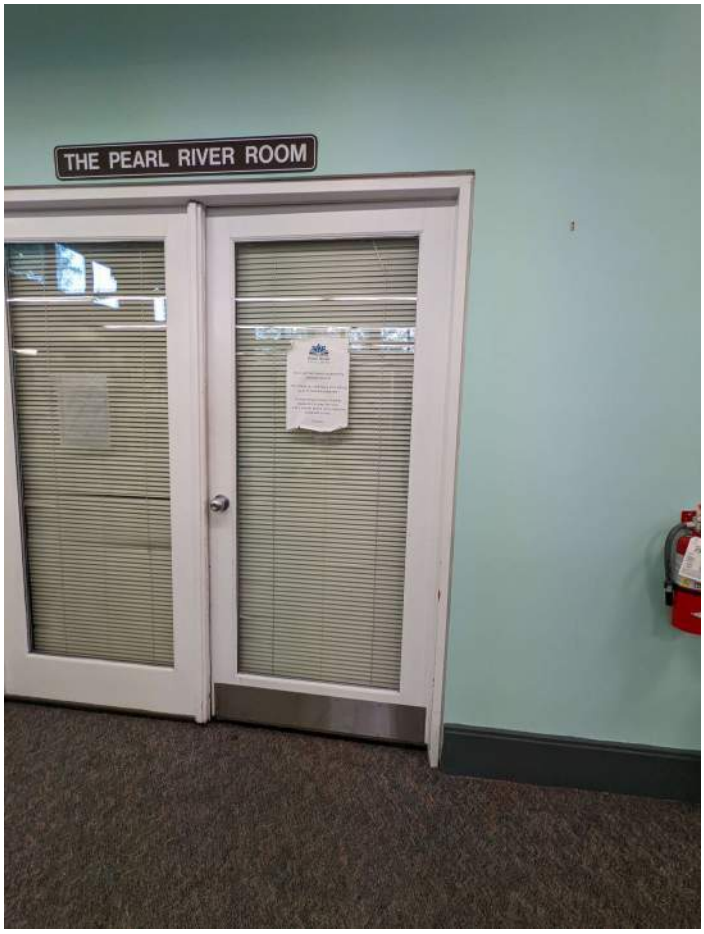
2578-02_23_0908 - 7011 - ENTRY.JPG

2578-02_23_0908 - 7012 - ENTRY.JPG

2578-02_23_0908 - 7014 - ENTRY.JPG



2578-02_23_0908 - 7013 - ENTRY.JPG



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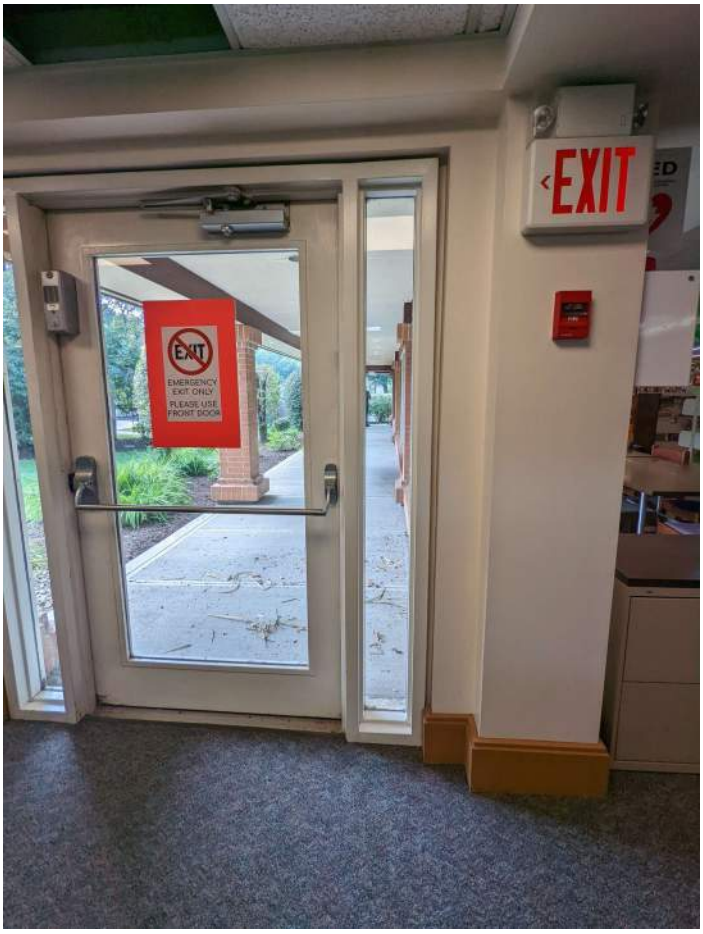


2578-02_23_0908 - 7016 - ENTRY.JPG

2578-02_23_0908 - 7018 - ENTRY.JPG

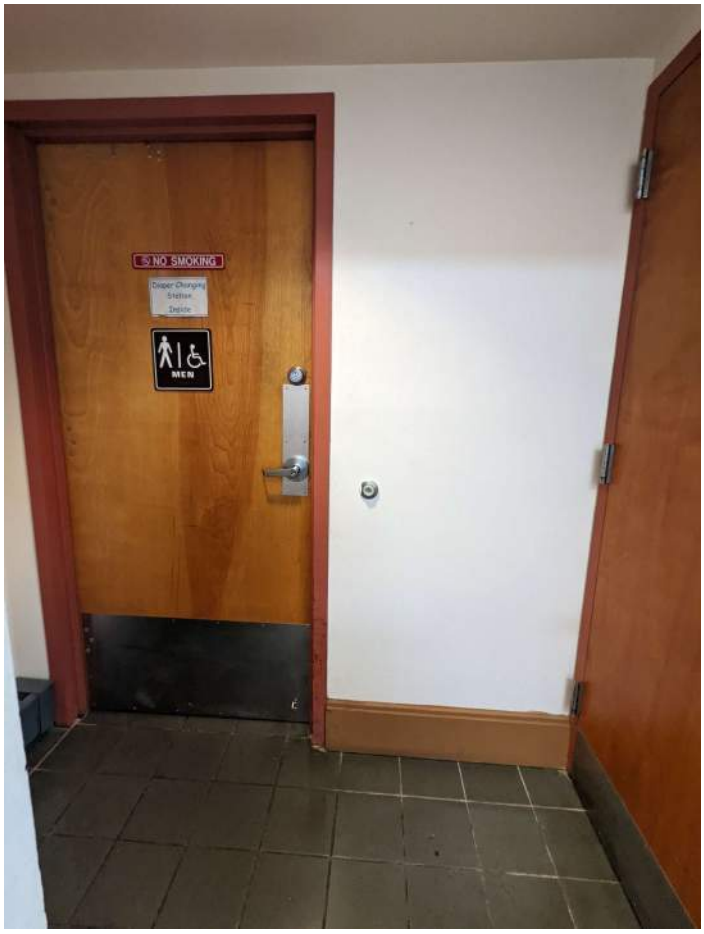
2578-02_23_0908 - 7017 - ENTRY.JPG

2578-02_23_0908 - 7019 - ENTRY.JPG

2578-02_23_0908 - 7020 - ENTRY.JPG

2578-02_23_0908 - 7022 - ENTRY.JPG

2578-02_23_0908 - 7021 - ENTRY.JPG



2578-02_23_0908 - 7023 - ENTRY.JPG

2578-02_23_0908 - 7024 - ENTRY.JPG

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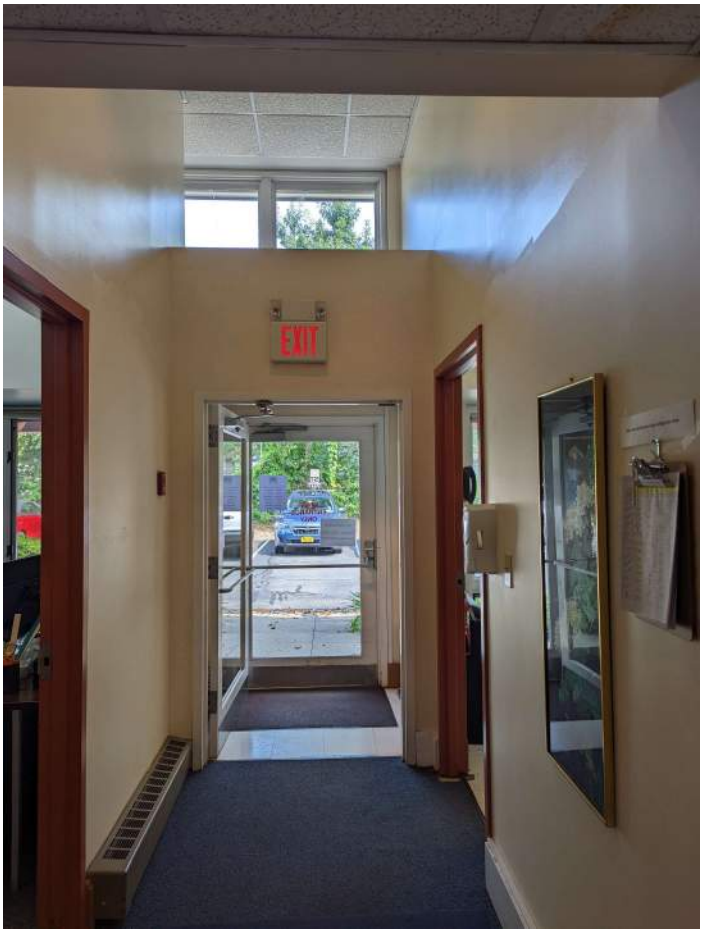

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2578-02_23_0908 - 7027 - ENTRY.JPG

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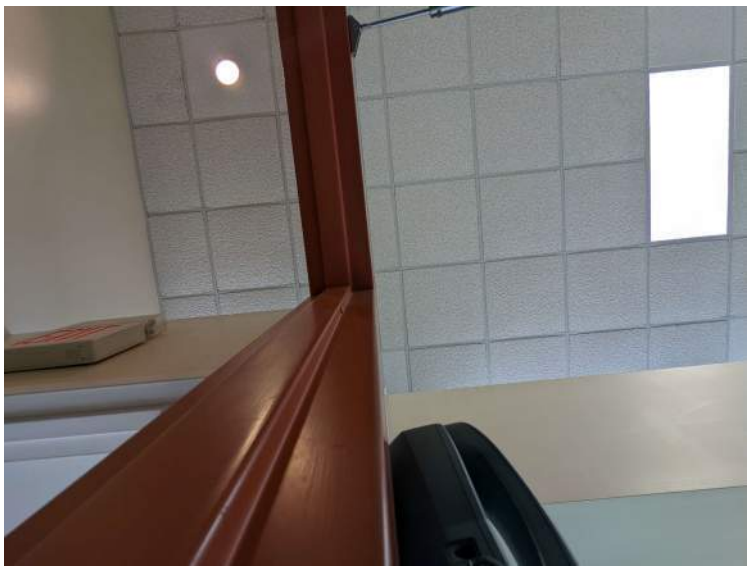
2578-02_23_0908 - 7029 - ENTRY.JPG



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2578-02_23_0908 - 7032 - ENTRY.JPG

2578-02_23_0908 - 7034 - ENTRY.JPG

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2578-02_23_0908 - 7035 - ENTRY.JPG

2578-02_23_0908 - 7036 - ENTRY.JPG

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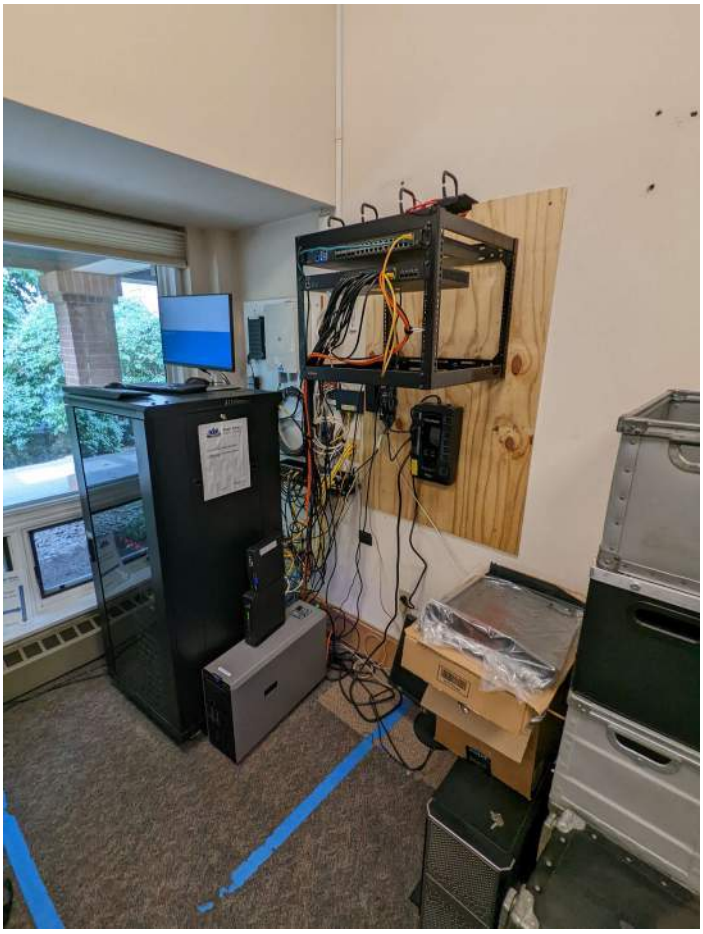
2578-02_23_0908 - 7039 - ENTRY.JPG



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2578-02_23_0908 - 7706 - ENTRY.JPG

2578-02_23_0908 - 7705 - ENTRY.JPG

2578-02_23_0908 - 7707 - ENTRY.JPG

2578-02_23_0908 - 7708 - ENTRY.JPG

2578-02_23_0908 - 7709 - ENTRY.JPG

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WEST LOUVERS
SEPTEMBER 2023

Lothrop Associates Architects D.P.C.

2578-02_23_0911 - 7121 - WEST LOUVERS (BG).JPG

2578-02_23_0911 - 7123 - WEST LOUVERS (BG).JPG

2578-02_23_0911 - 7122 - WEST LOUVERS (BG).JPG

2578-02_23_0911 - 7124 - WEST LOUVERS (BG).JPG

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Public Library

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2021-2024

VISIBLE PIPES
NOVEMBER 2023

Lothrop Associates Architects D.P.C.

2578-02_22_1107 - PICS (BG) (7915).JPG

2578-02_22_1107 - PICS (BG) (7916).JPG

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Public Library

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2021-2024

ROOF
JANUARY 2024

Lothrop Associates Architects D.P.C.

2578-02_24_0127 - 7899 NW CORNER ROOF (KS).JPG

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Public Library

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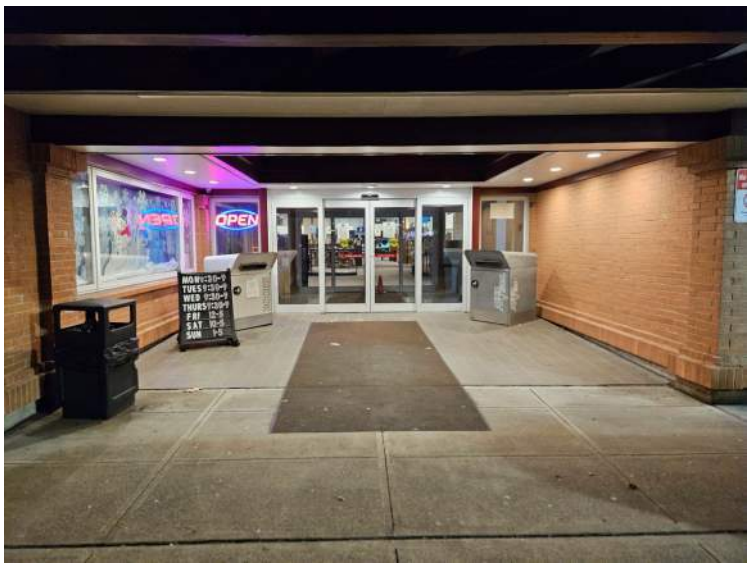
2021-2024

ENTRY
FEBRUARY 2024

Lothrop Associates Architects D.P.C.

2578-02_24_0205 - 9701 - EXTERIOR ENTRY (BG).JPG

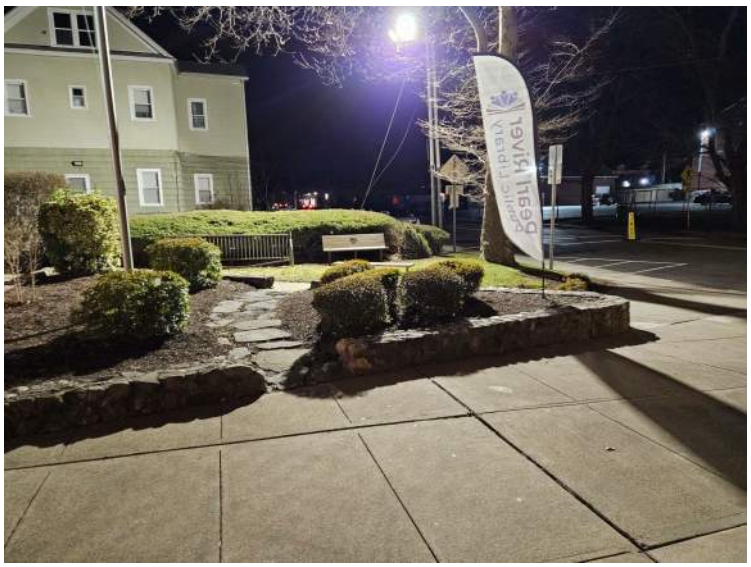


2578-02_24_0205 - 9703 - EXTERIOR ENTRY (BG).JPG

2578-02_24_0205 - 9702 - EXTERIOR ENTRY (BG).JPG

2578-02_24_0205 - 9704 - EXTERIOR ENTRY (BG).JPG

2578-02_24_0205 - 9705 - EXTERIOR ENTRY (BG).JPG



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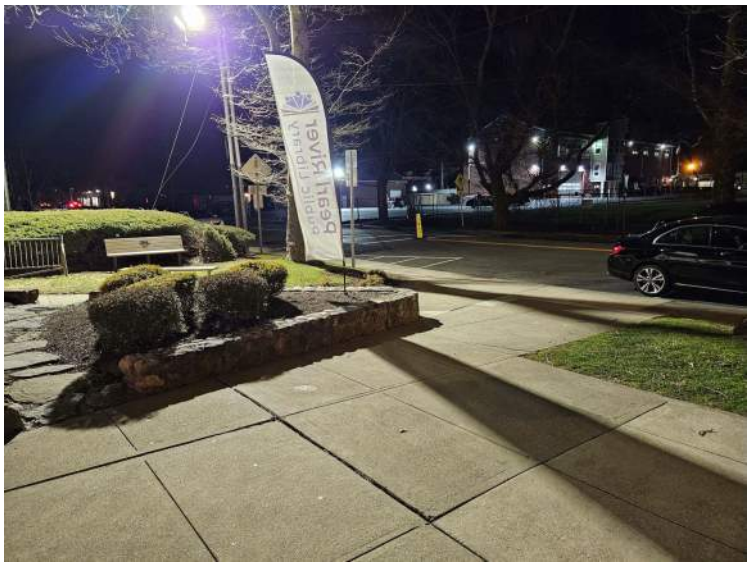
2578-02_24_0205 - 9706 - EXTERIOR ENTRY (BG).JPG



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2578-02_24_0205 - 9711 - EXTERIOR ENTRY (BG).JPG

2578-02_24_0205 - 9710 - EXTERIOR ENTRY (BG).JPG

2578-02_24_0205 - 9712 - EXTERIOR ENTRY (BG).JPG

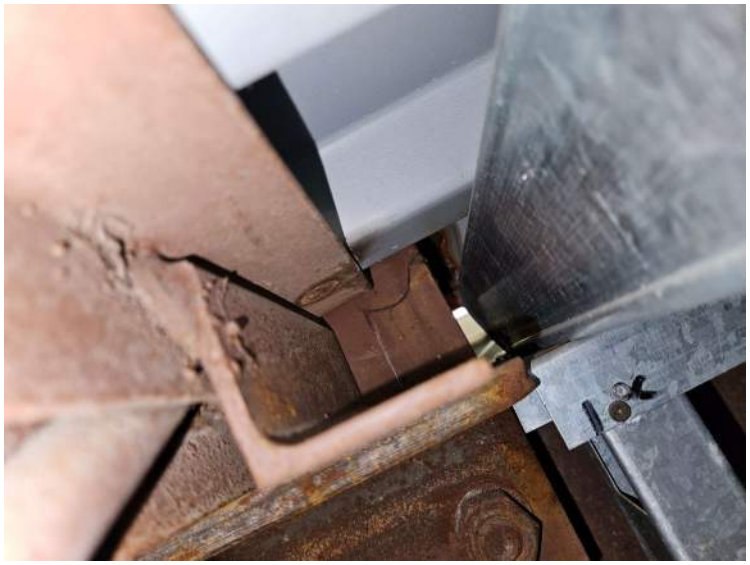
2578-02_24_0205 - 9714 - EXTERIOR ENTRY (BG).JPG

Pearl River
Public Library

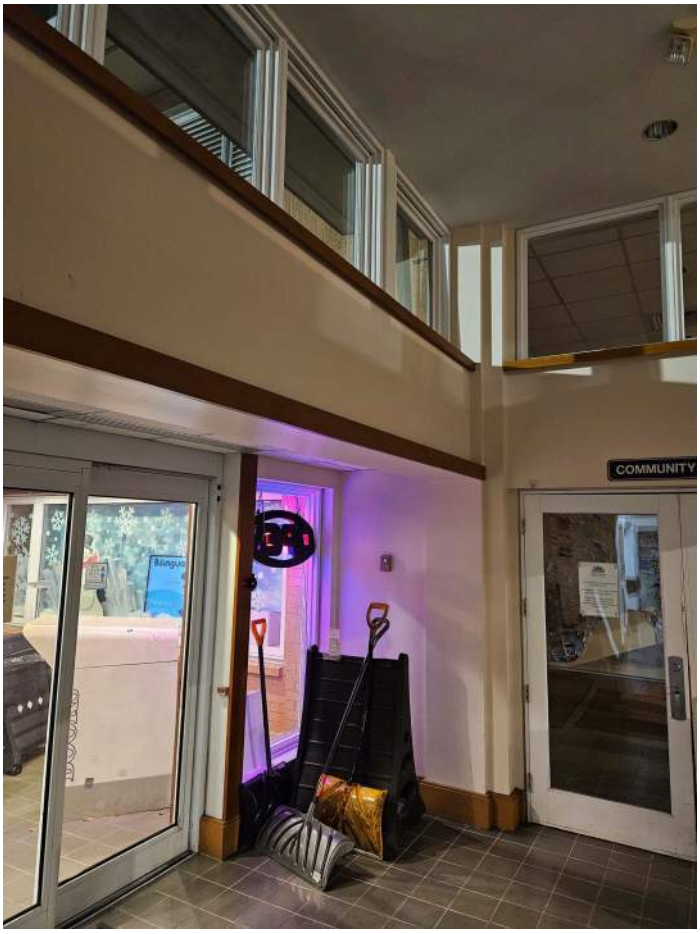
Photo Book
2021-2024

INTERIOR WINDOWS
FEBRUARY 2024

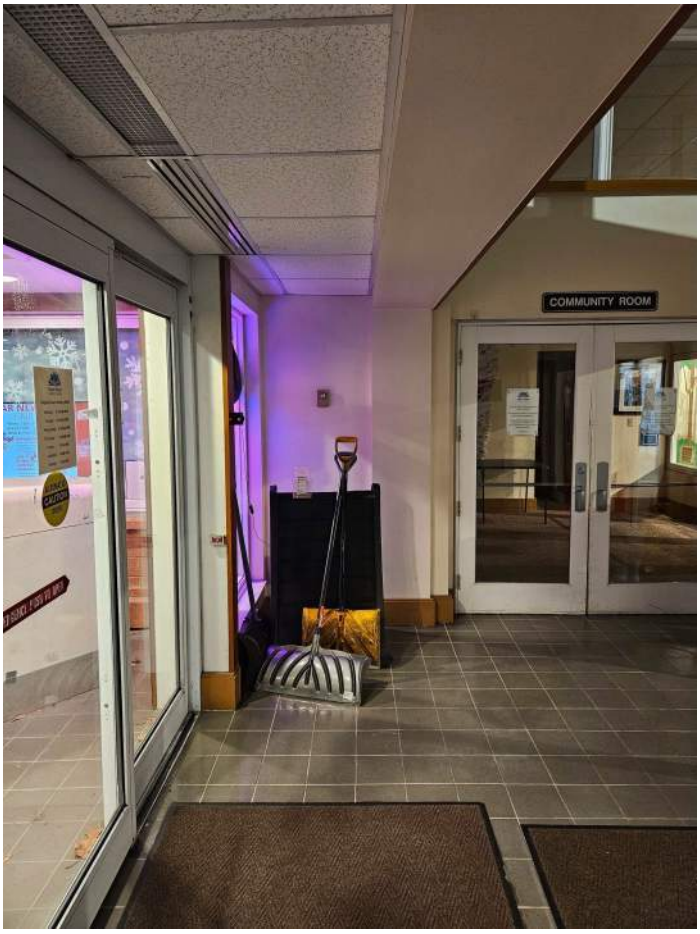
Lothrop Associates Architects D.P.C.



2578-02_24_0205 - 9505 - COLUMN F-10 (BG).JPG



2578-02_24_0205 - 9902 - VESTIBULE (BG).JPG



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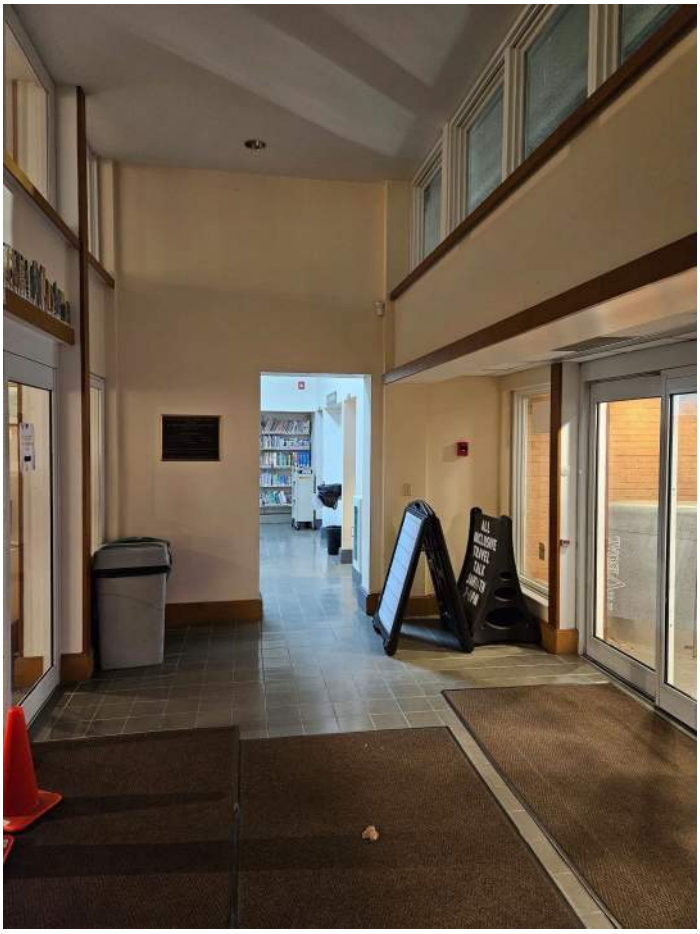
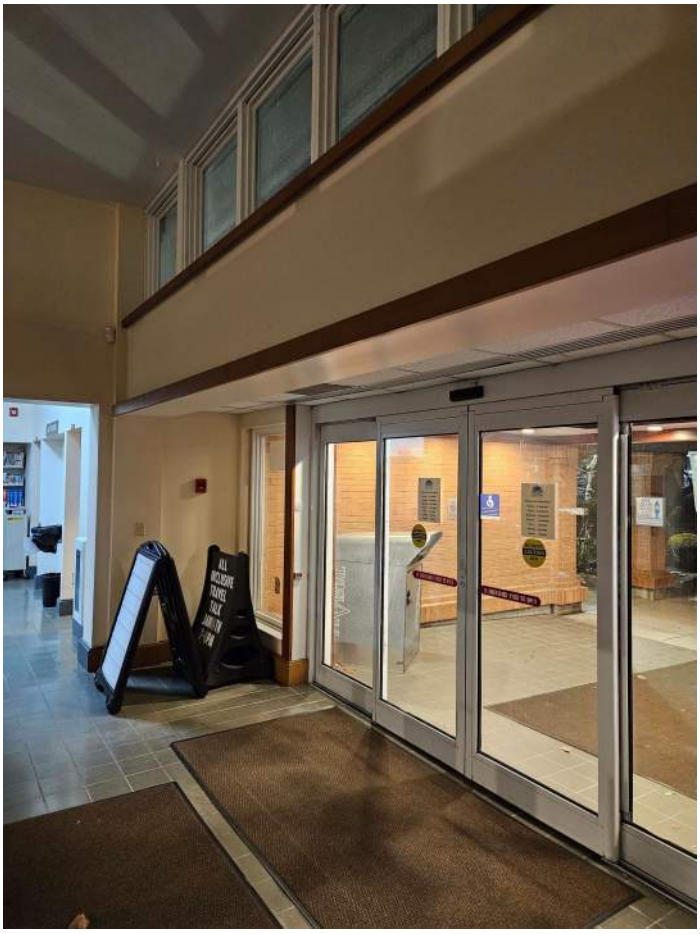
2578-02_24_0205 - 9903 - VESTIBULE (BG).JPG



2578-02_24_0205 - 9904 - VESTIBULE (BG).JPG



2578-02_24_0205 - 9905 - VESTIBULE (BG).JPG

Pearl River
Public Library

Photo Book

ROOF+INTERIOR 360 PHOTOS
February 2024

360 images are available in JPG format and properly viewed with free software that may be downloaded from https://support.theta360.com/en/download/pcmac/

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2578-02_24_0228 - R0010010.JPG

2578-02_24_0228 - R0010012.JPG

2578-02_24_0228 - R0010011.JPG

2578-02_24_0228 - R0010013.JPG

2578-02_24_0228 - R0010014.JPG

2578-02_24_0228 - R0010016.JPG

2578-02_24_0228 - R0010015.JPG

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2578-02_24_0228 - R0010020.JPG

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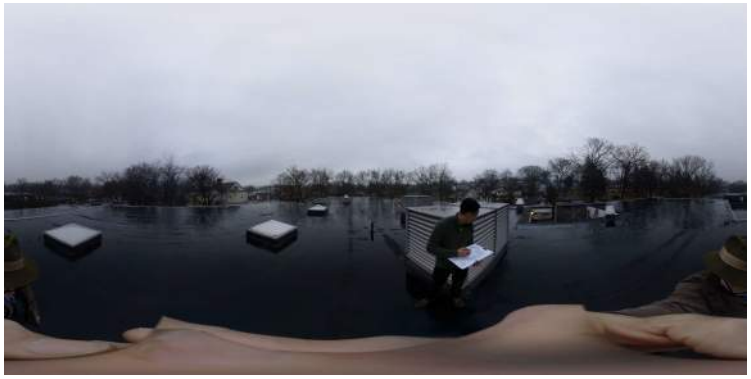

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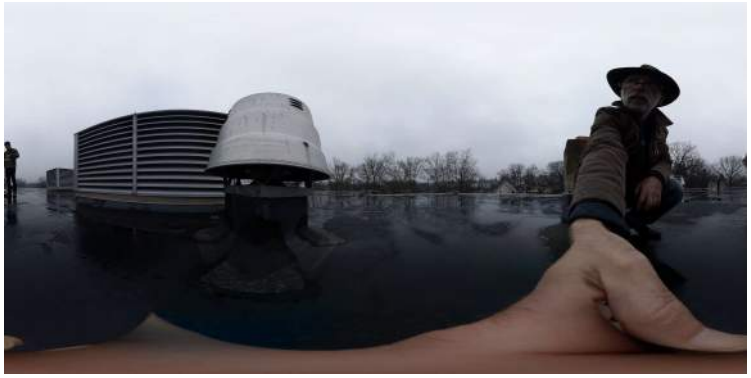

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2578-02_24_0228 - R0010050.JPG

2578-02_24_0228 - R0010051.JPG

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Public Library

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2021-2024

VOLUME 2

Lothrop Associates Architects D.P.C.

Pearl River
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Photo Book
2021-2024

STAFF AREAS
JANUARY 2022

Lothrop Associates Architects D.P.C.

2578-02_22_1031 - 001217 - (AS) - CENTER HUB AREA.JPG

2578-02_22_1031 - 001221 - (AS) - CENTER HUB AREA.JPG

2578-02_22_1031 - 001218 - (AS) - CENTER HUB AREA.JPG

2578-02_22_1031 - 001222 - (AS) - CENTER HUB AREA.JPG

2578-02_22_0125 - AS PHOTO (7121).JPG

2578-02_22_0125 - AS PHOTO (7123).JPG

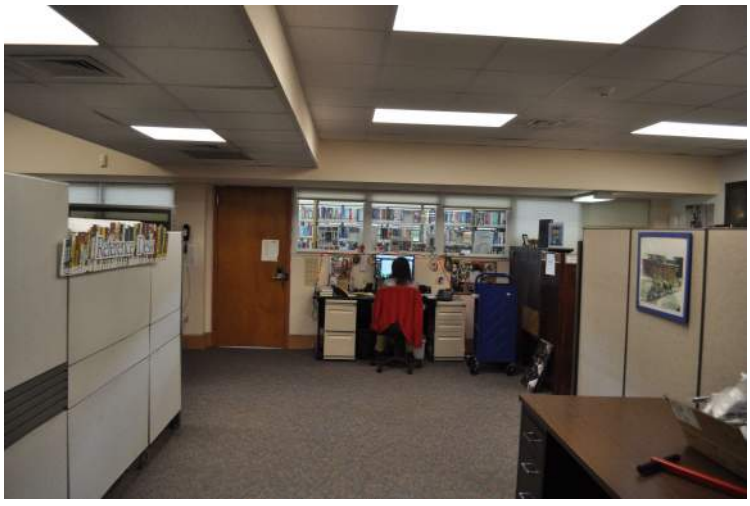
2578-02_22_0125 - AS PHOTO (7122).JPG

2578-02_22_0125 - AS PHOTO (7124).JPG

2578-02_22_0125 - AS PHOTO (7126).JPG

2578-02_22_0125 - AS PHOTO (7134).JPG

2578-02_22_0125 - AS PHOTO (7130).JPG



2578-02_22_0125 - AS PHOTO (7141).JPG

2578-02_22_0125 - AS PHOTO (7142) PEARL RIVER ROO.JPG

Pearl River
Public Library

Photo Book
2021-2024

INTERIOR
OCTOBER 2022

Lothrop Associates Architects D.P.C.

2578-02_22_1031 - 001013 - (AS) - WORK RM HALLWAY.JPG

2578-02_22_1031 - 001018 - CL MID BAY S TO N - (AS).JPG

2578-02_22_1031 - 001016 - (AS) - WORK RM HALLWAY.JPG

2578-02_22_1031 - 001020 - (AS) CHILDRENS LIB.JPG

2578-02_22_1031 - 001021 - CL W SOFFIT.JPG

2578-02_22_1031 - 001045 - CL ENTRY HALL.JPEG

2578-02_22_1031 - 001022 - (AS) - CHILDRENS LIB.JPG

2578-02_22_1031 - 001051 - CL W SOFFIT.JPEG

2578-02_22_1031 - 001053 - CL ATRIUM TO N.JPEG

2578-02_22_1031 - 001055 - CL DESK TO NW.JPG

2578-02_22_1031 - 001054 - CL ATRIUM TO E.JPEG

2578-02_22_1031 - 001064 - CENTER HUB.JPG

2578-02_22_1031 - 001104 - (AS) - BOOK CHARGE AND RETURN STAFF A...

2578-02_22_1031 - 001107 - (AS) - CENTER HUB AREA.JPG

2578-02_22_1031 - 001106 - (AS) - CENTER HUB AREA.JPG

2578-02_22_1031 - 001108 - (AS) - READING AREA 1.JPG

2578-02_22_1031 - 001109 - (AS) - READING AREA 1.JPG

2578-02_22_1031 - 001112 - (AS) - READING AREA 1.JPG

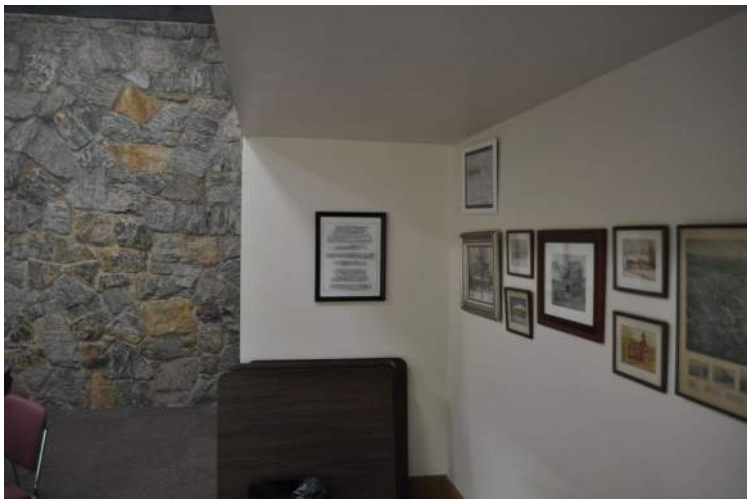
2578-02_22_1031 - 001110 - (AS) - READING AREA 1.JPG

2578-02_22_1031 - 001114 - (AS) - YOUNG ADULT AREA.JPG

2578-02_22_1031 - 001115 - (AS) - YOUNG ADULT AREA.JPG

2578-02_22_1031 - 001134 - (AS) - PEARL RIVER RM.JPG

2578-02_22_1031 - 001119 - (AS) - PEARL RIVER RM.JPG



2578-02_22_1031 - 1135 - PEARL RIVER RM.JPG

2578-02_22_1031 - 001136 - (AS) - PEARL RIVER RM.JPG

2578-02_22_1031 - 001150 - (AS) - PEARL RIVER RM.JPG

2578-02_22_1031 - 001138 - (AS) - PEARL RIVER RM.JPG

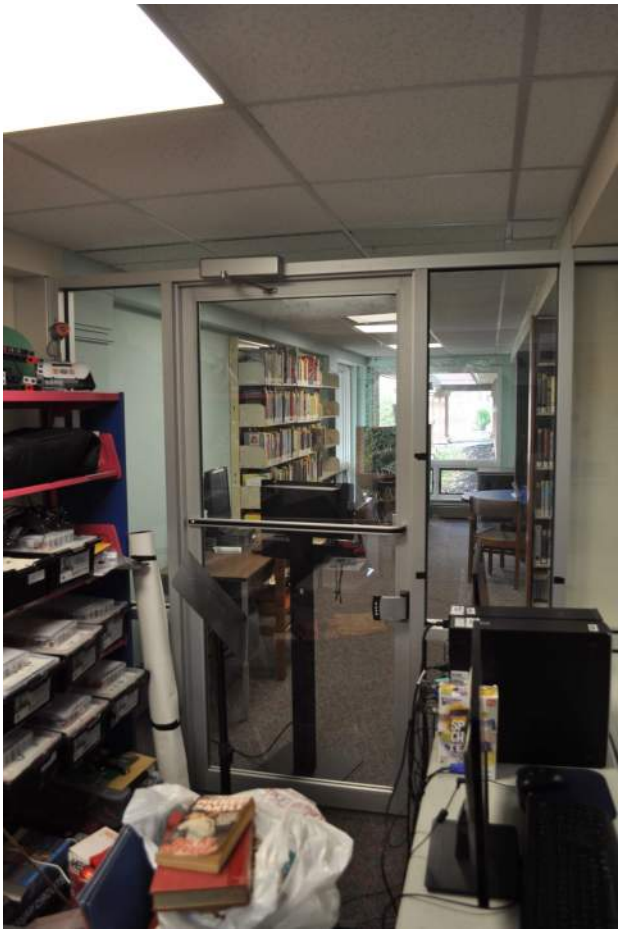
2578-02_22_1031 - 001151 - (AS) - STEM LAB.JPG

2578-02_22_1031 - 001152 - (AS) - STEM LAB.JPG

2578-02_22_1031 - 001158 - (AS) - STEM LAB.JPG

2578-02_22_1031 - 001153 - (AS) - STEM LAB.JPG

2578-02_22_1031 - 001164 - (AS) - STEM LAB.JPG



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2578-02_22_1031 - 1173 - STEM LAB.JPG

2578-02_22_1031 - 001173 - (AS) - STEM LAB.JPG

2578-02_22_1031 - 001180 - (AS) - MAIN STACK AREA.JPG

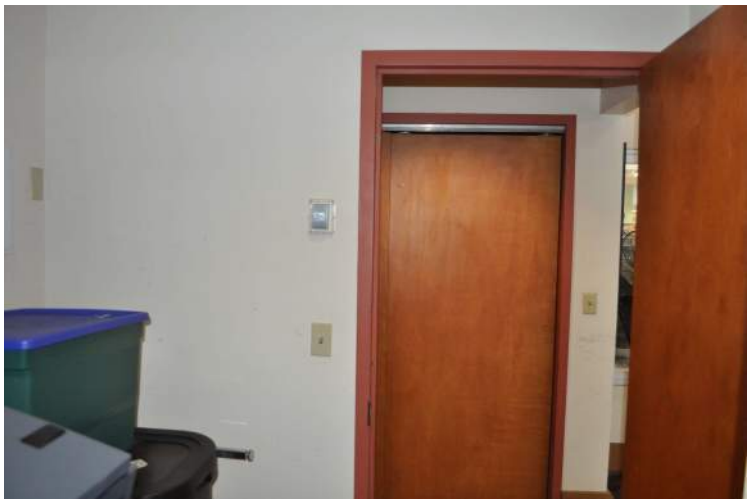
2578-02_22_1031 - 001185 - (AS) - MAIN STACK AREA.JPG

2578-02_22_1031 - 001189 - (AS) - MAIN STACK AREA.JPG

2578-02_22_1031 - 001186 - (AS) - MAIN STACK AREA.JPG

2578-02_22_1031 - 001196 - (AS) - STAFF AREA.JPG

2578-02_22_1031 - 001197 - (AS) - STAFF AREA.JPG



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2578-02_22_1031 - 001208 - (AS) - COM RM STORAGE.JPG

2578-02_22_1031 - 001211 - (AS) - COM RM STORAGE.JPG

2578-02_22_1031 - 001215 - (AS) - CENTER HUB AREA.JPG

2578-02_22_1031 - 001213 - CENTER HUB.JPG

2578-02_22_1031 - 001216 - (AS) - CENTER HUB AREA.JPG

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2578-02_22_1031 - 001243 - (AS) - READING AREA 1.JPG

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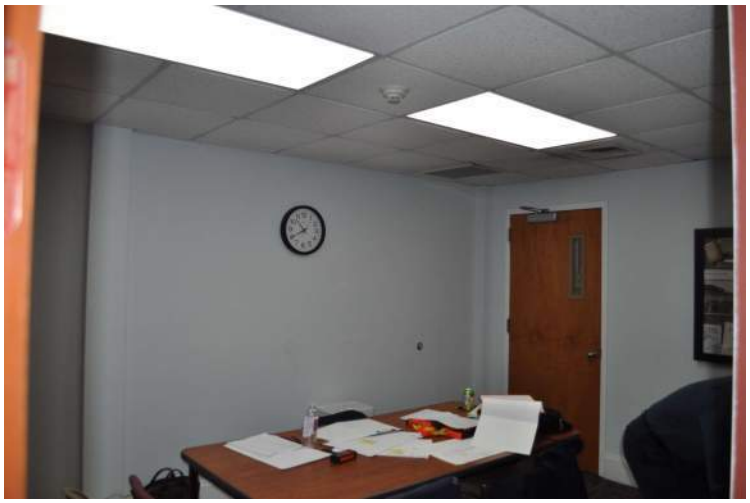

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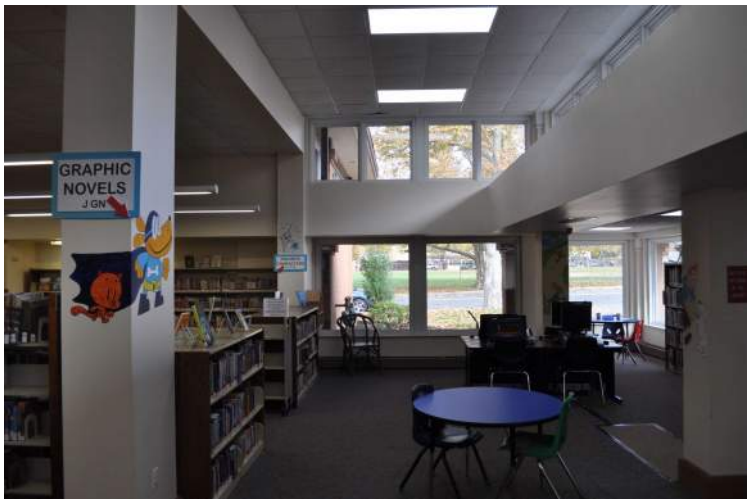

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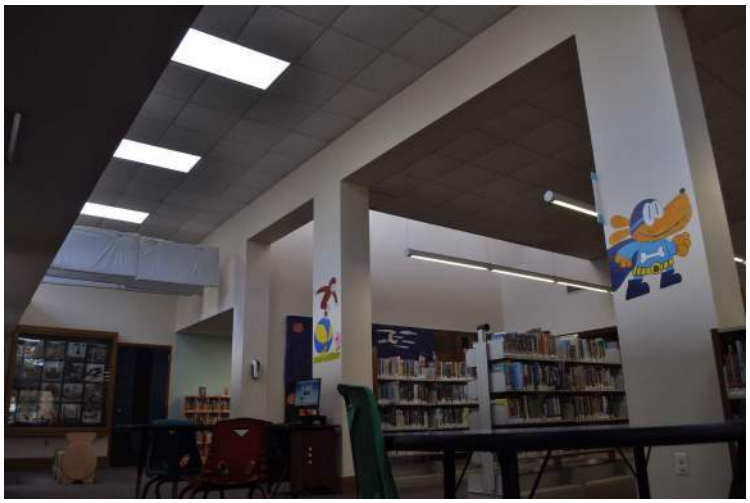

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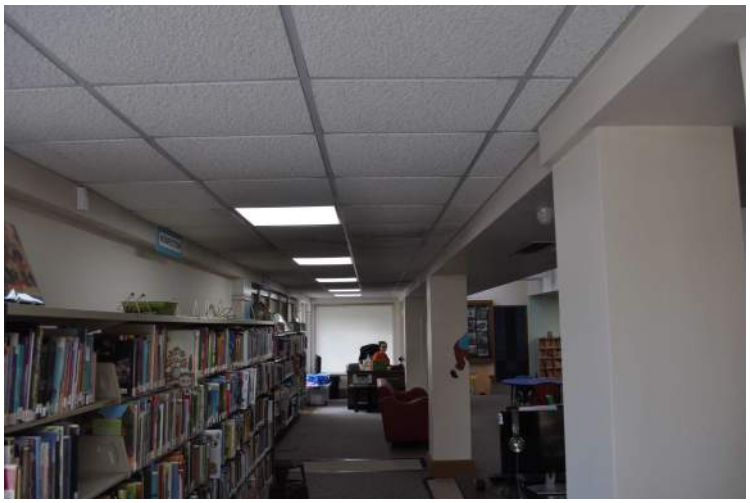

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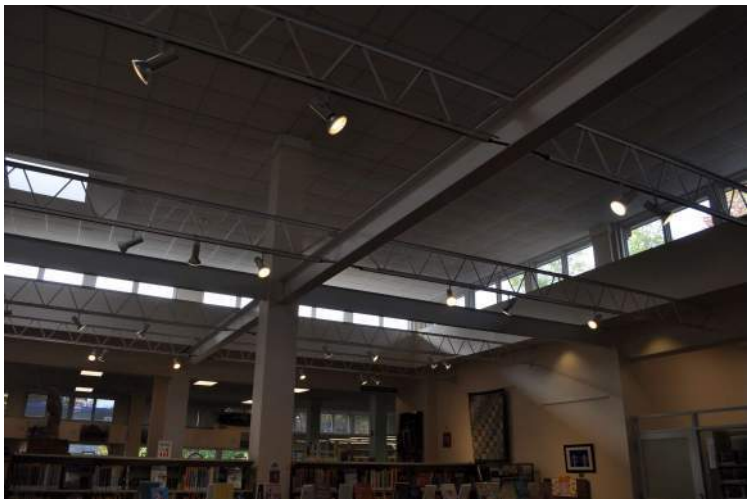

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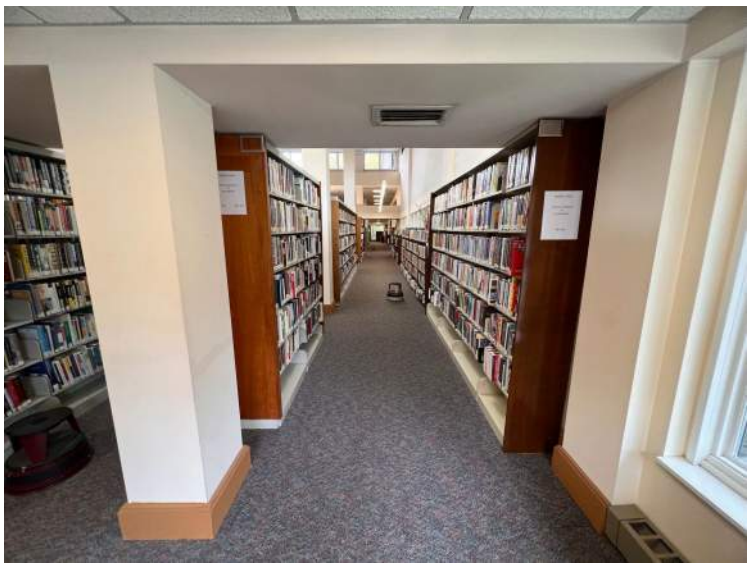

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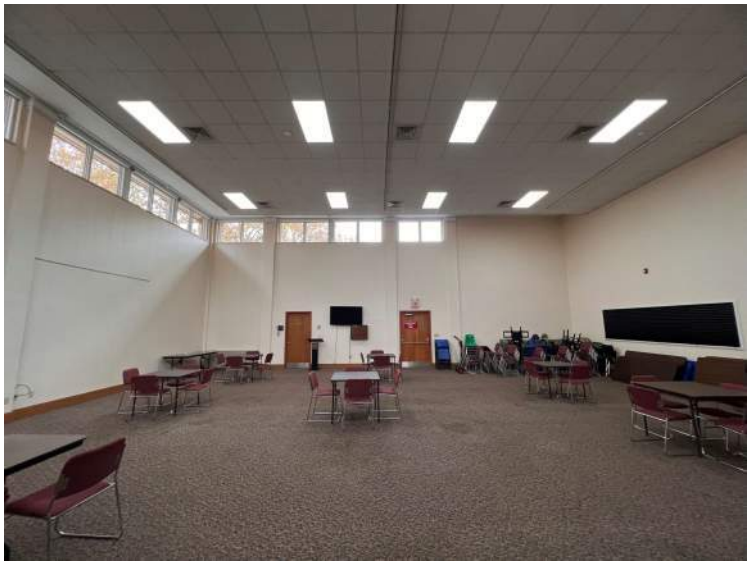

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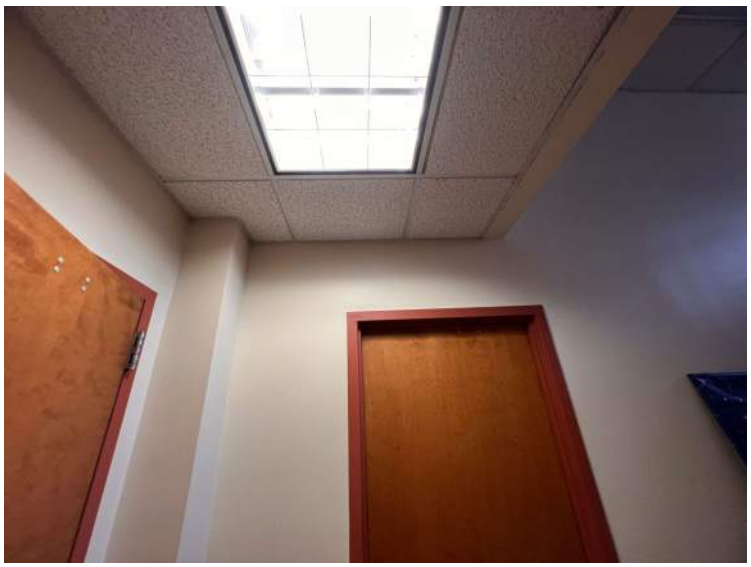

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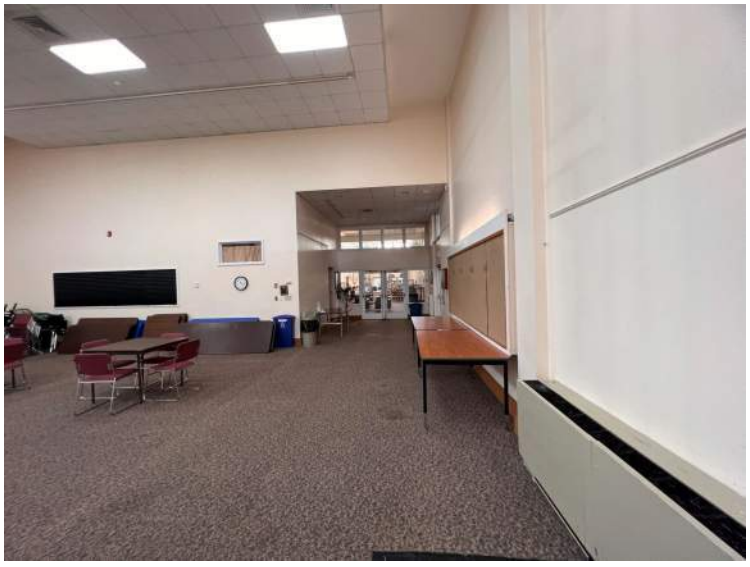

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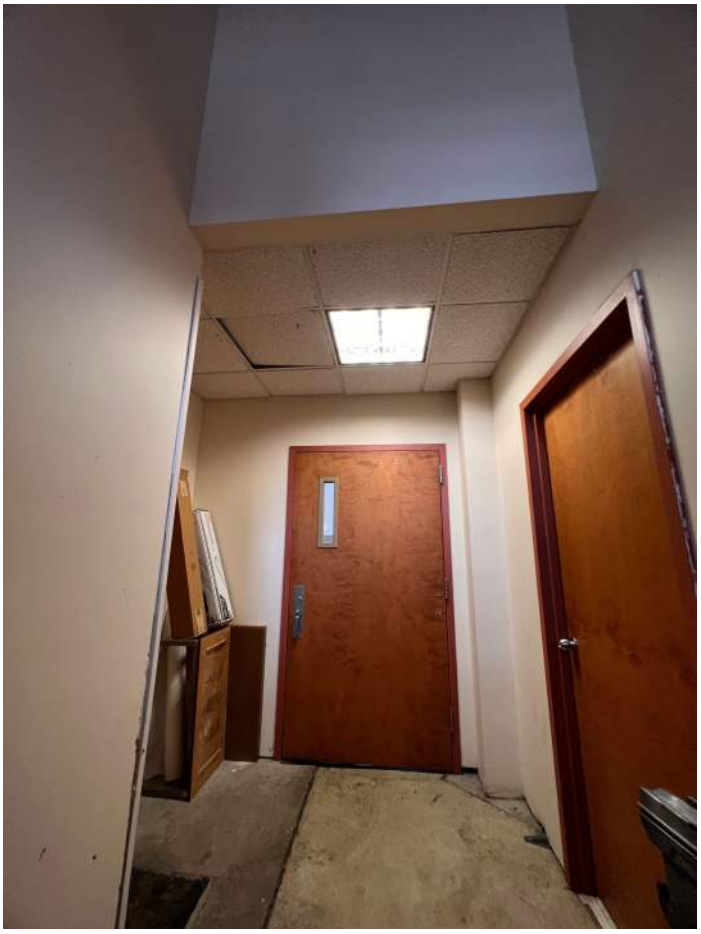

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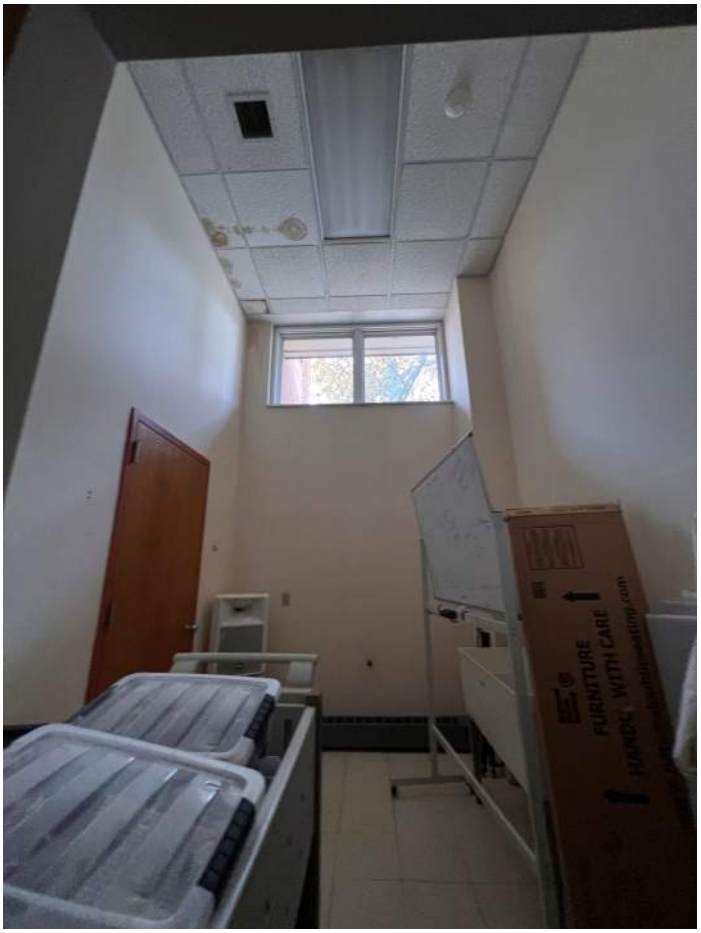

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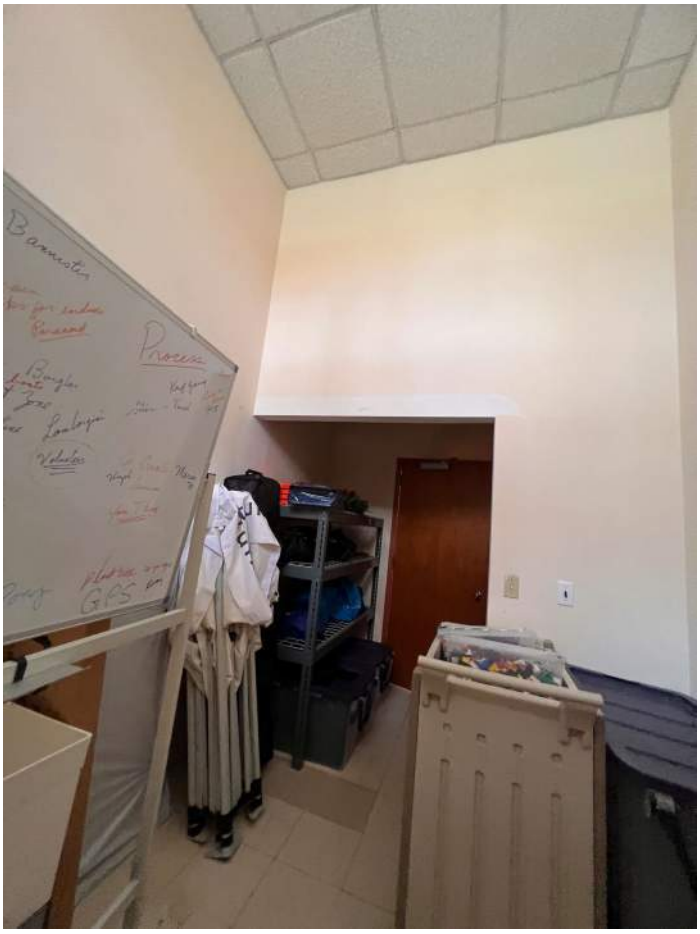

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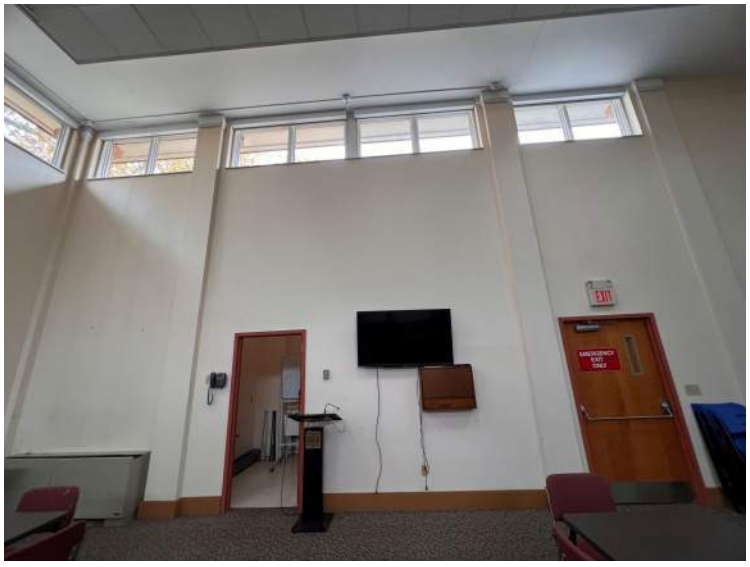

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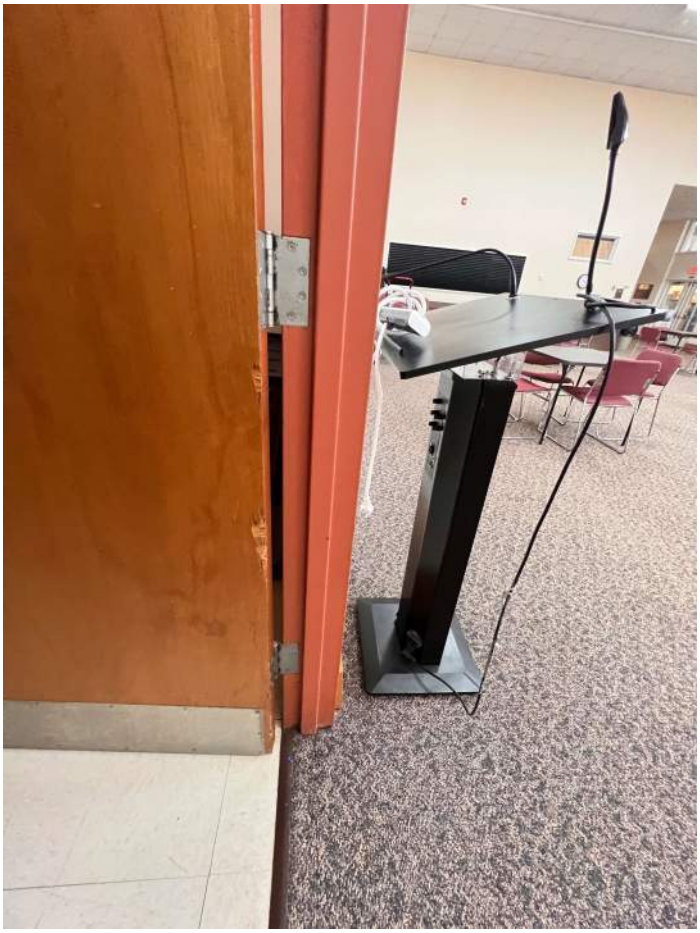

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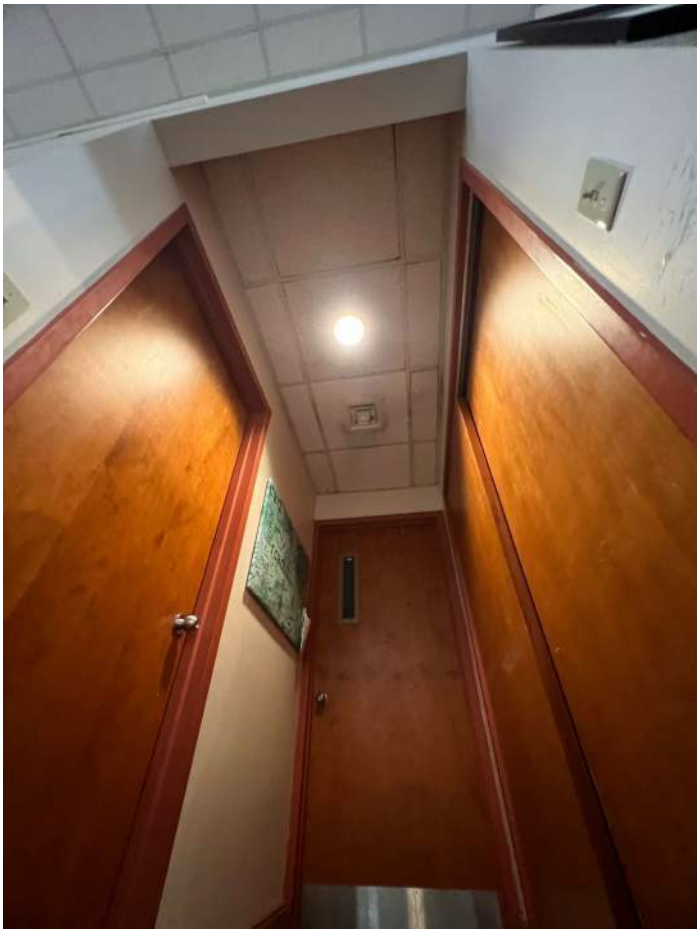

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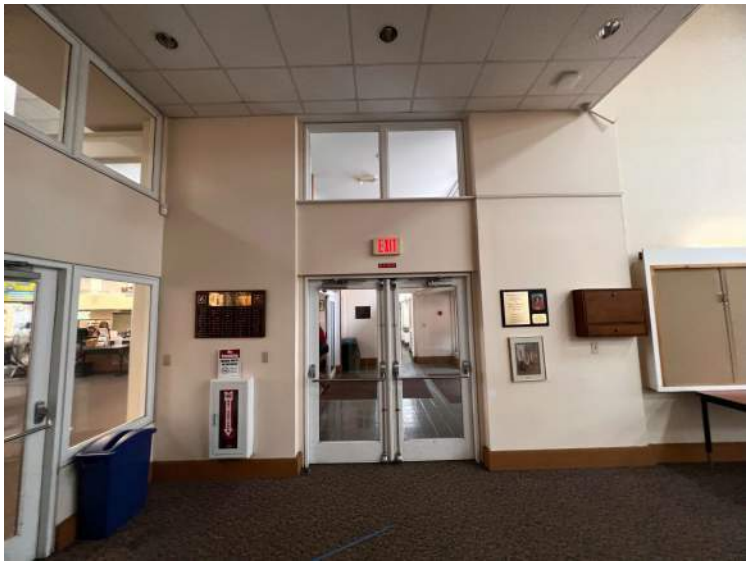

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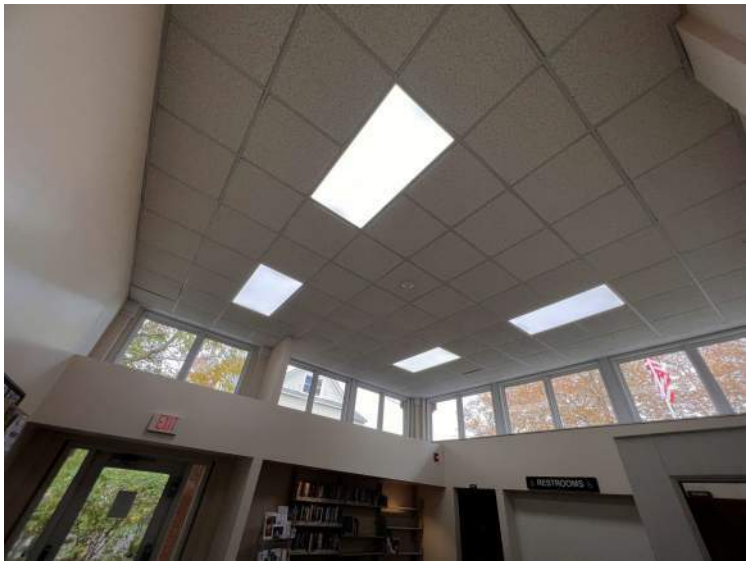

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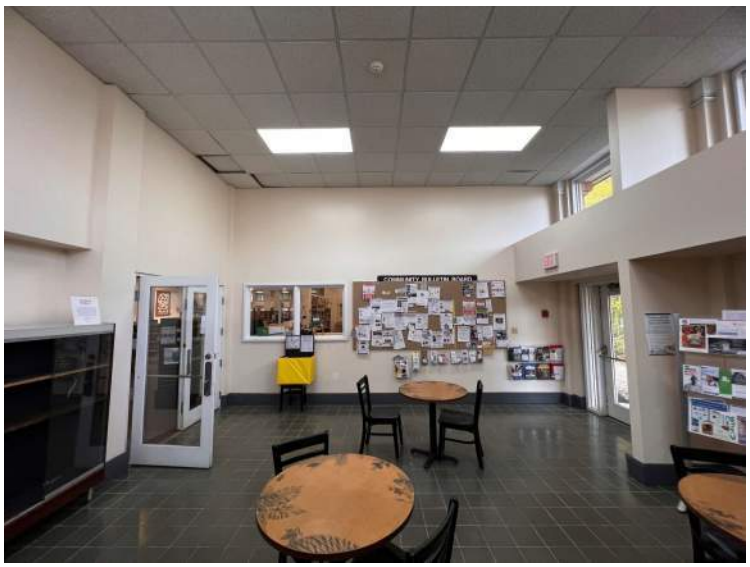

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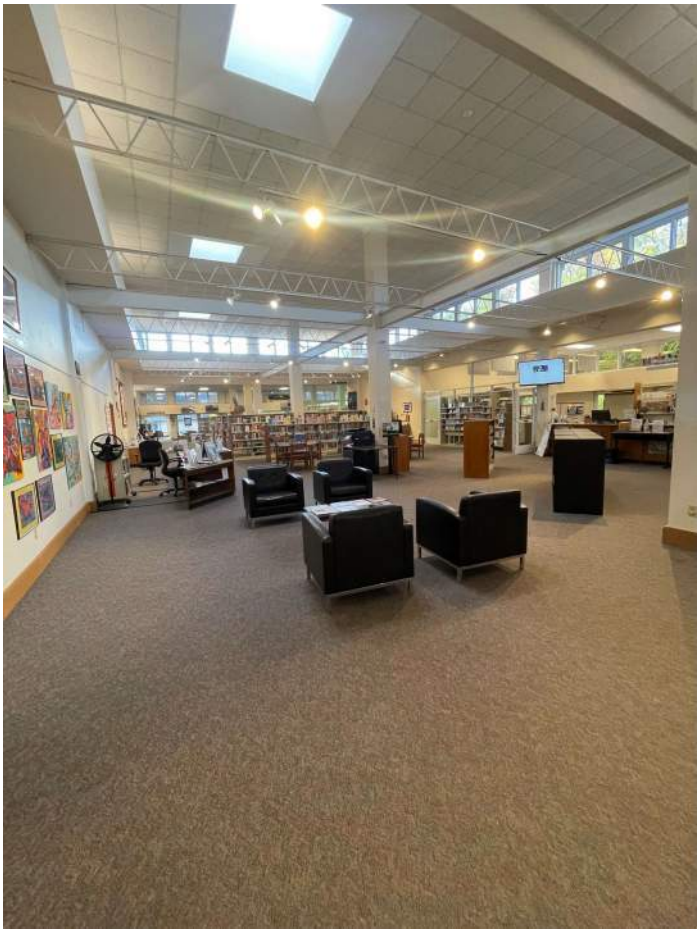

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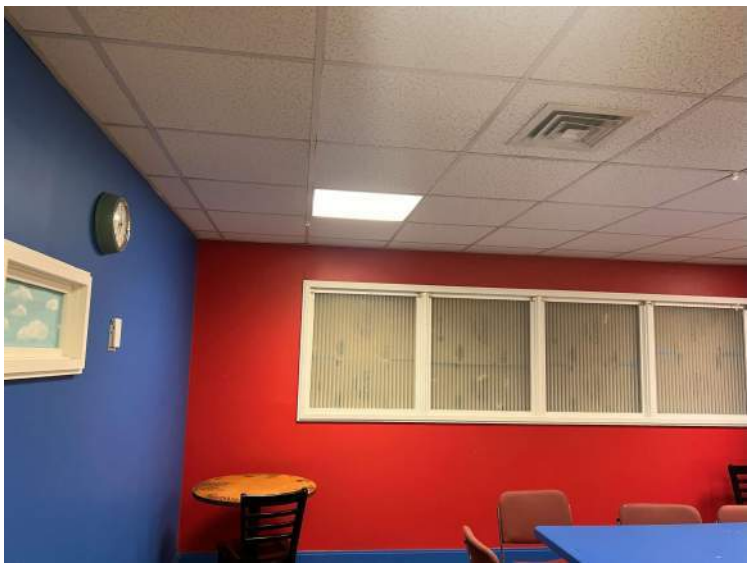

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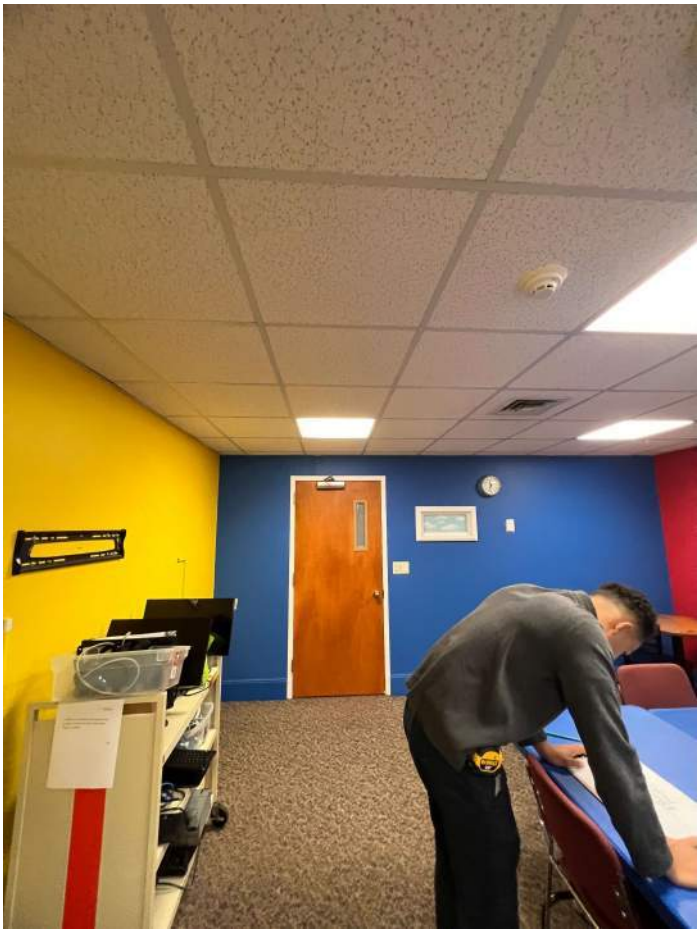

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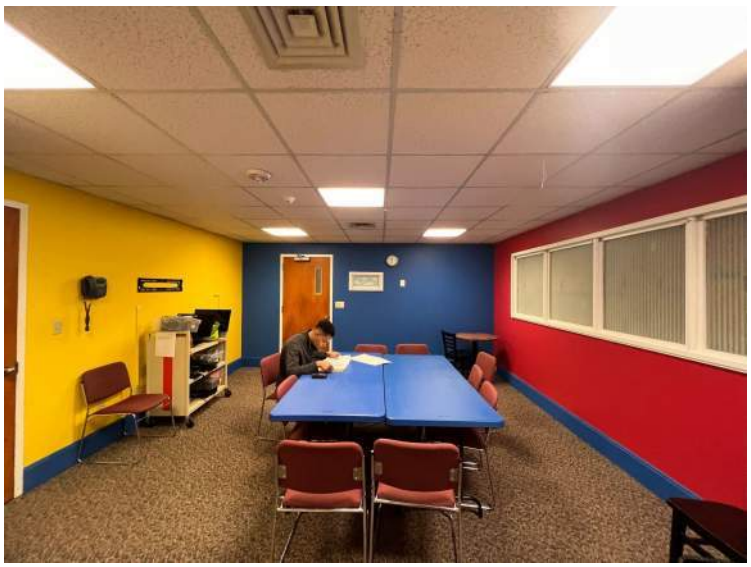

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2578-02_22_1104 - 1417.JPG

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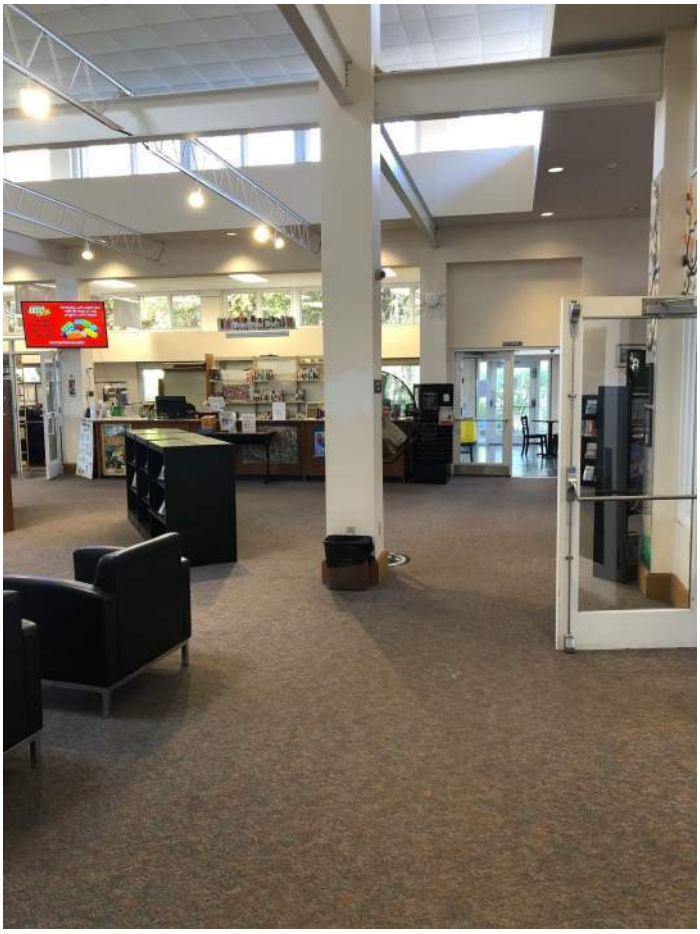

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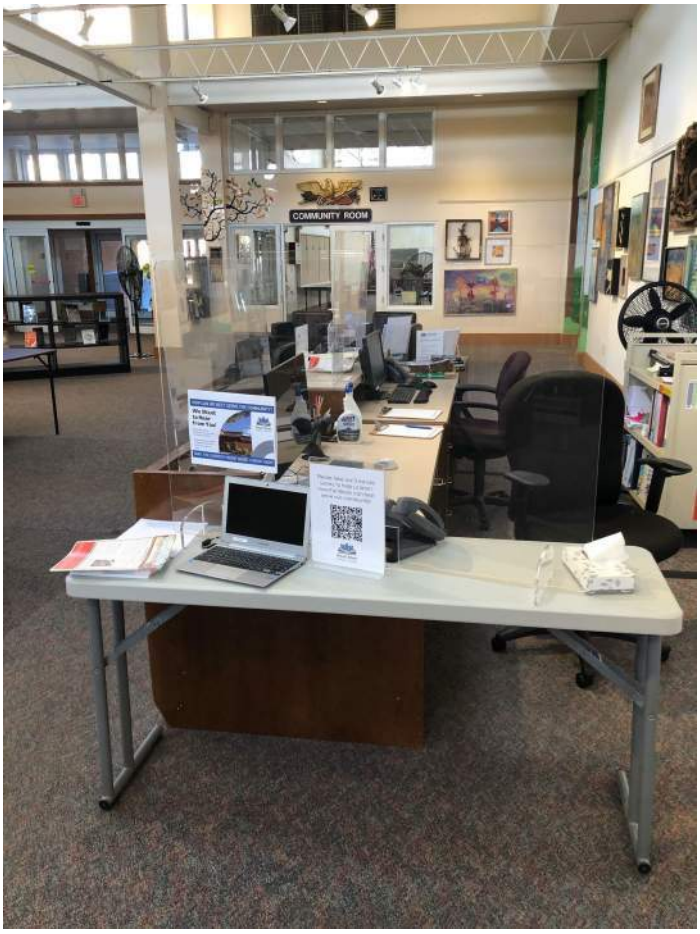

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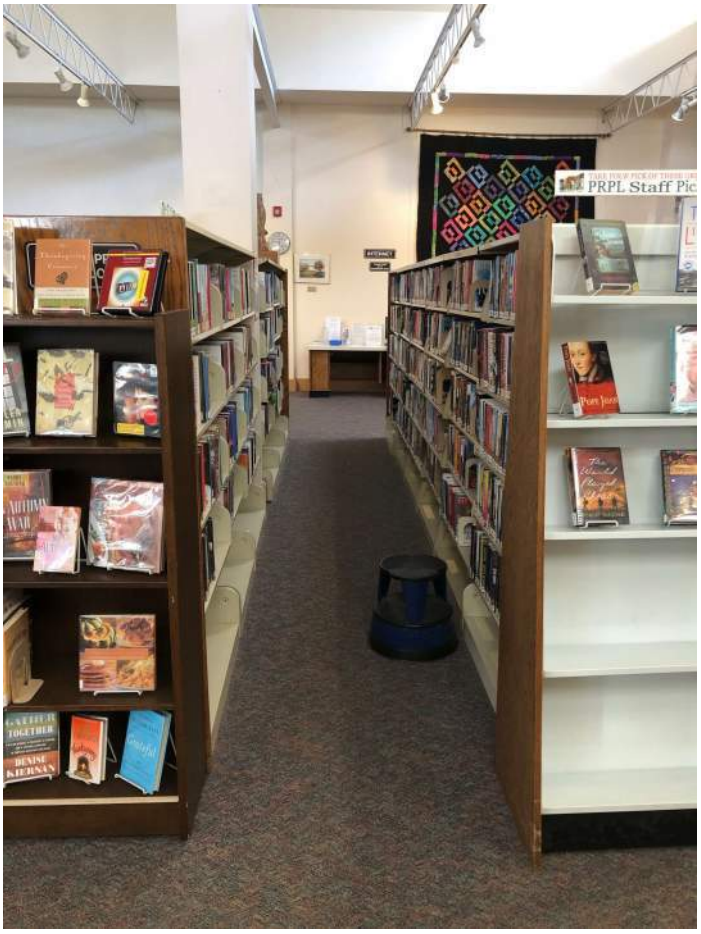

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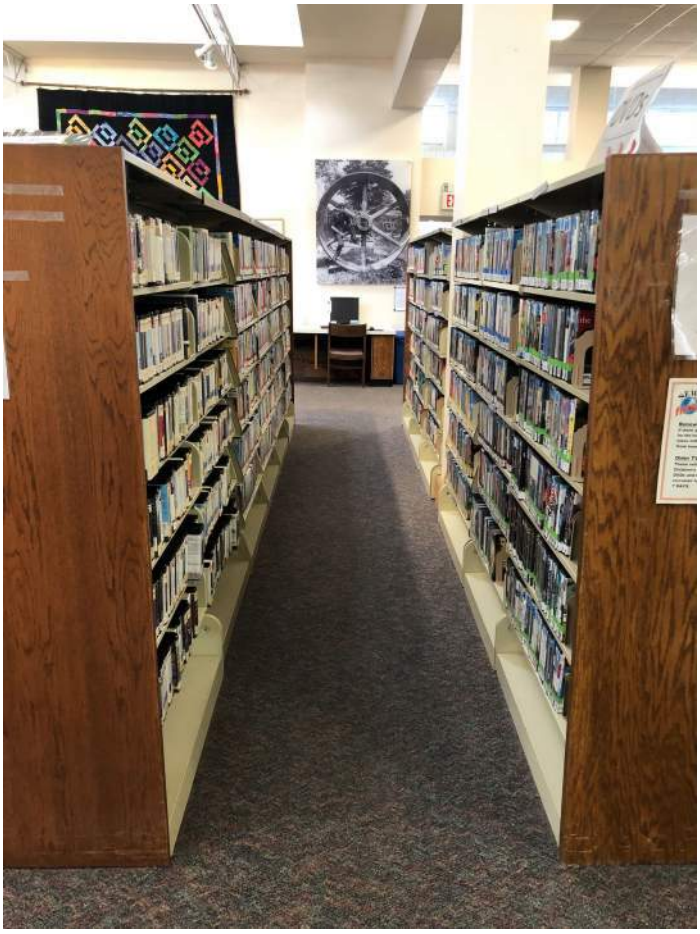

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STAFF AREAS
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2578-02_23_0619 - 6601 - STAFF AREA PHOTOS.JPG

2578-02_23_0619 - 6603 - STAFF AREA PHOTOS.JPG

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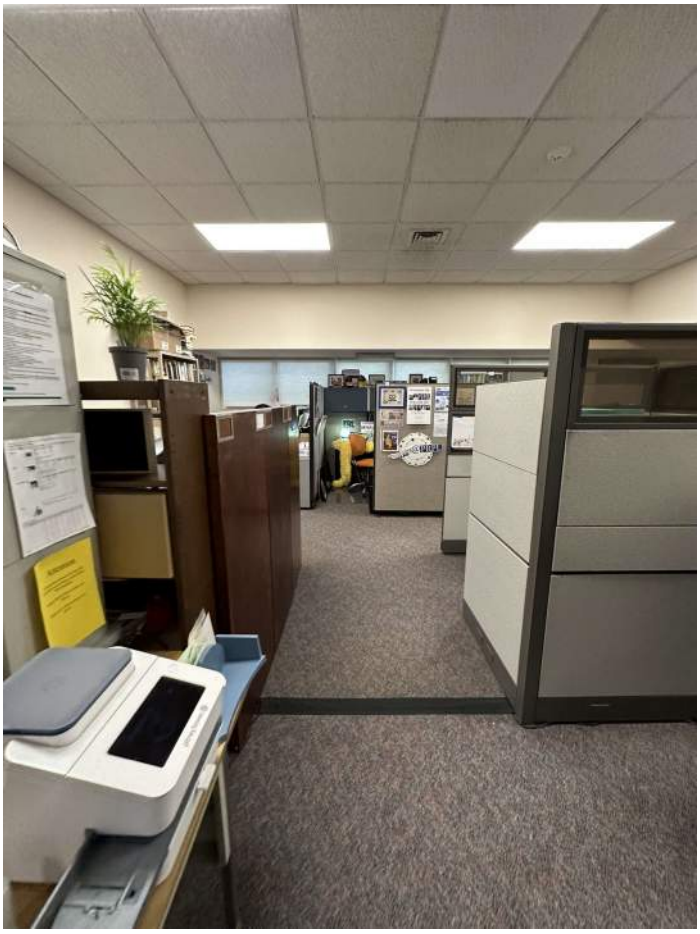

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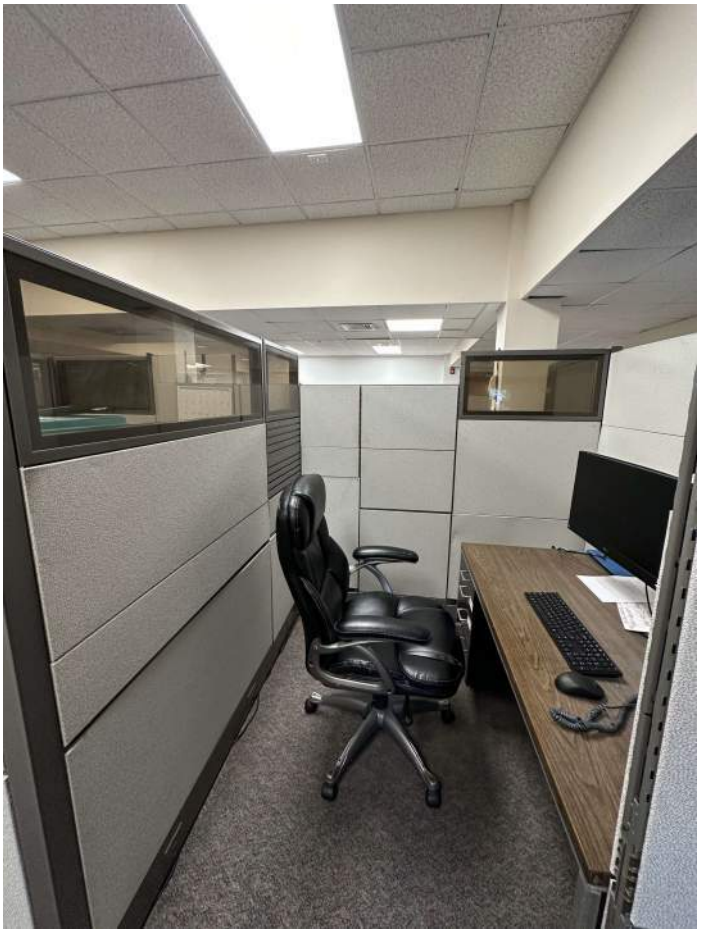

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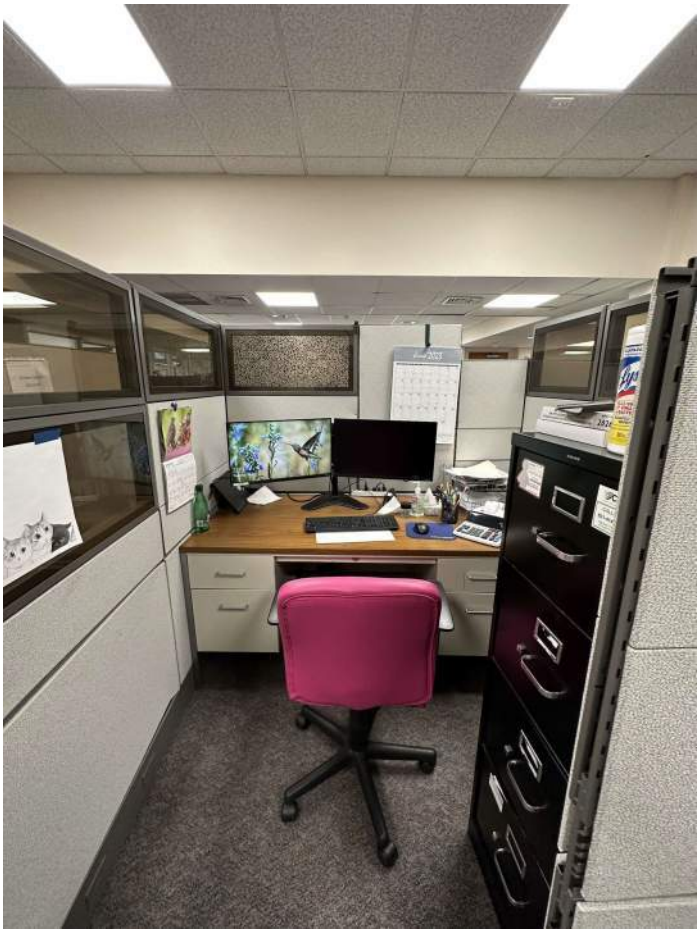

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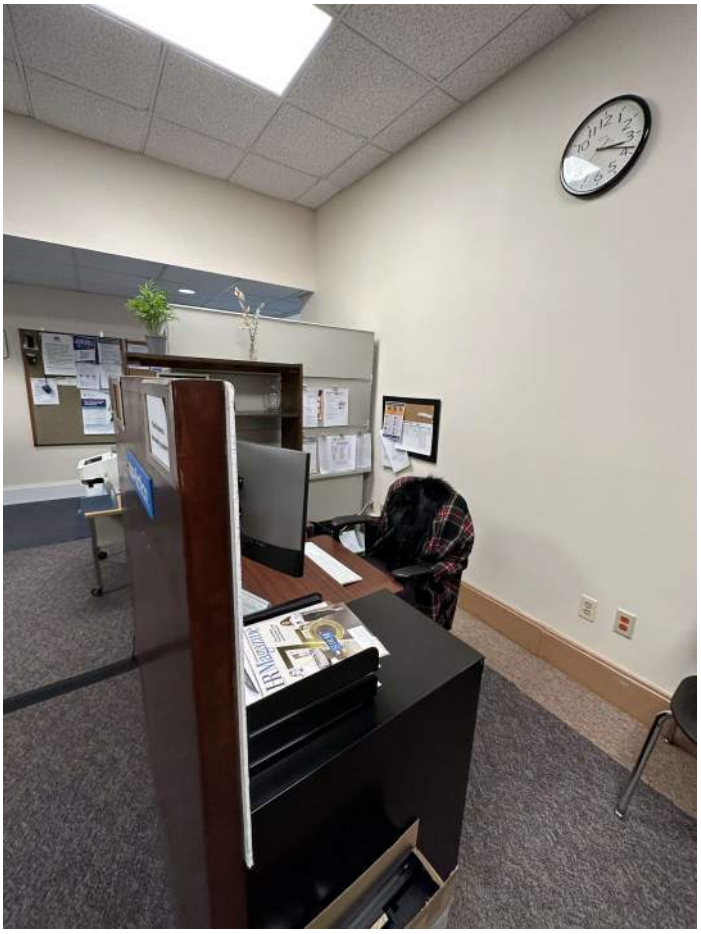

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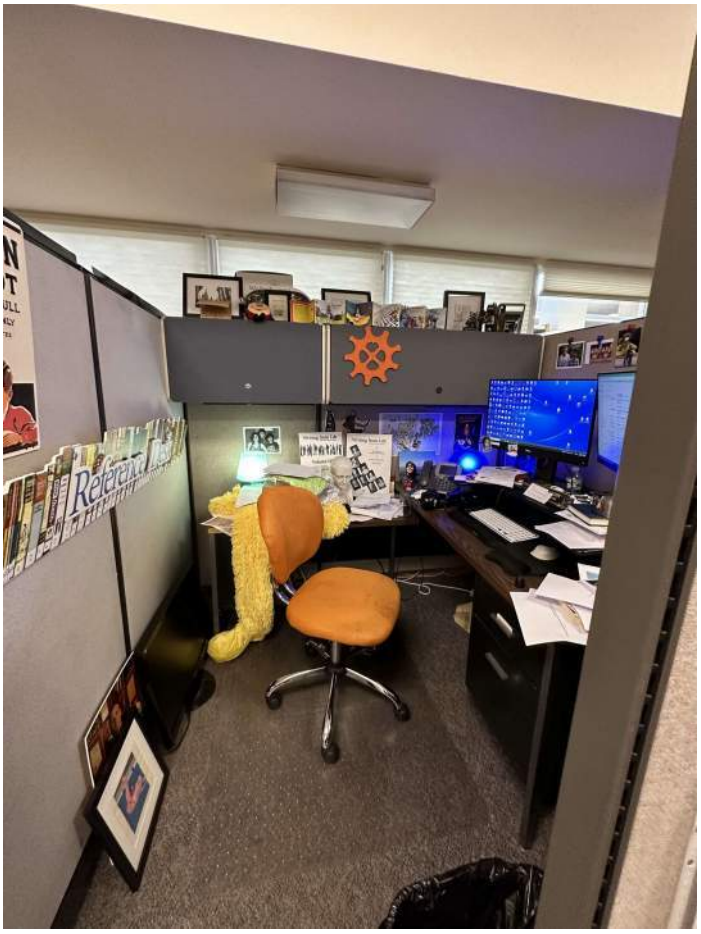

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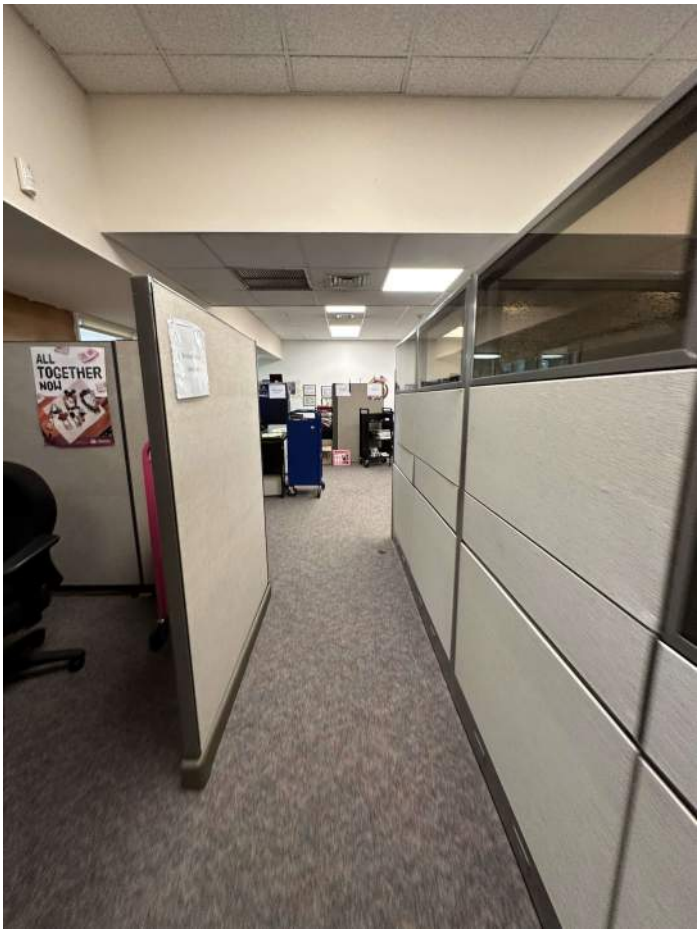

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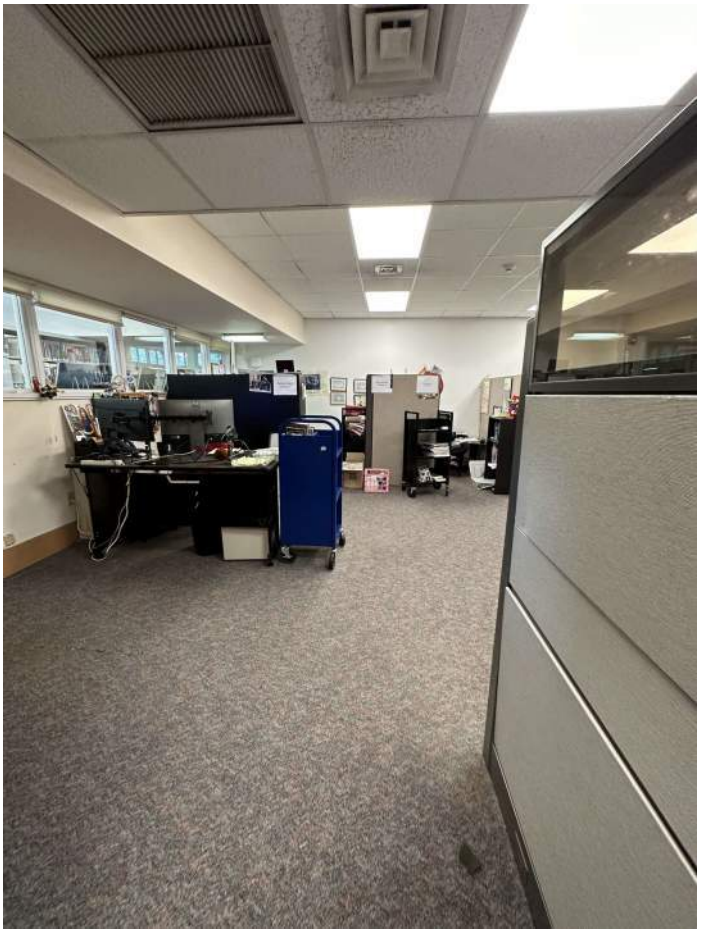

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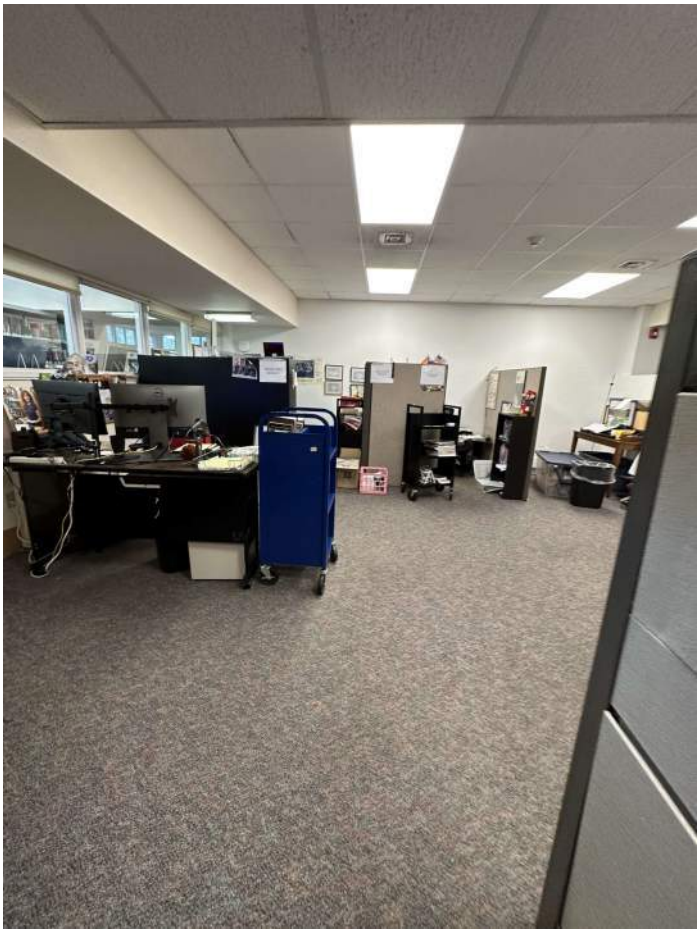

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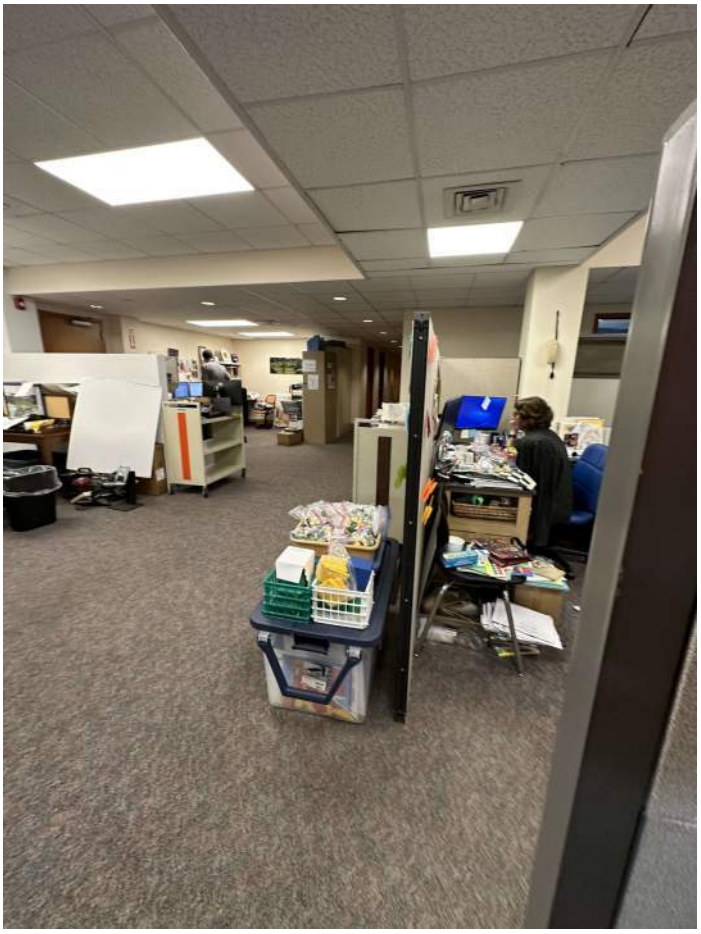

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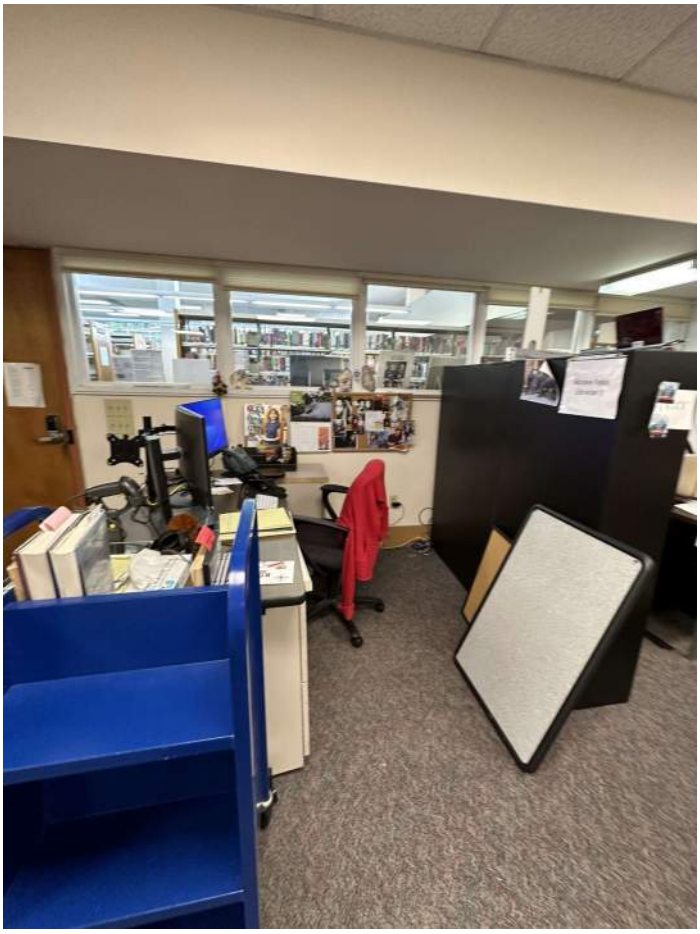

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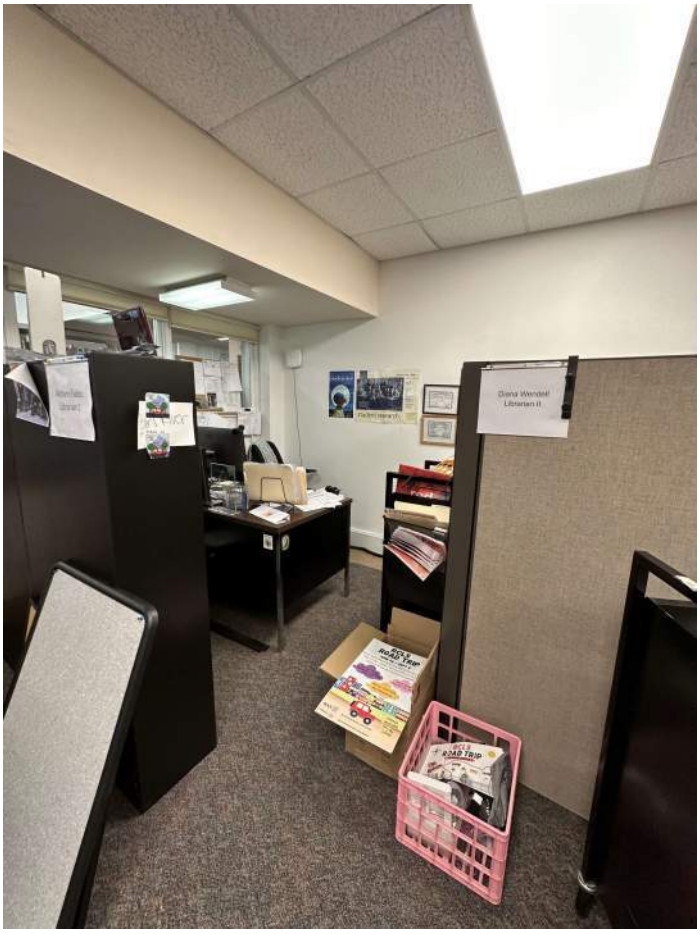

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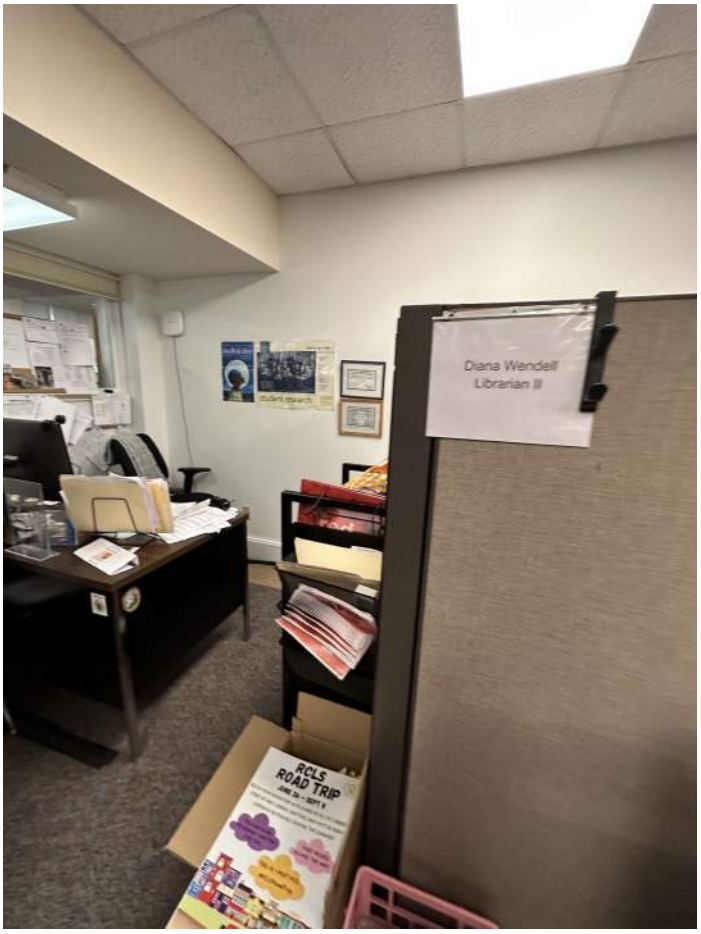

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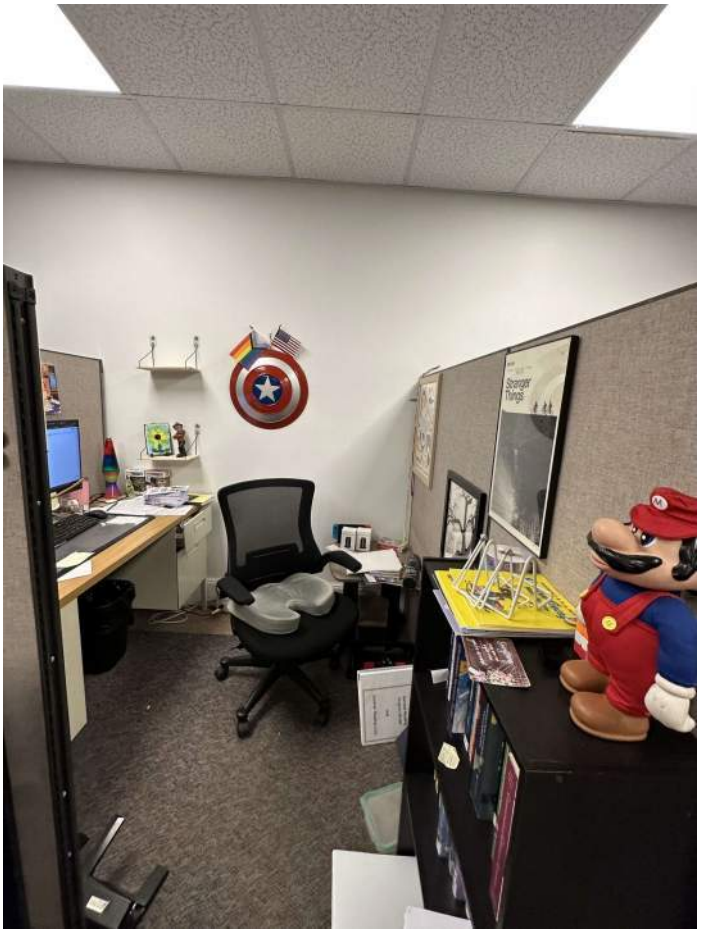

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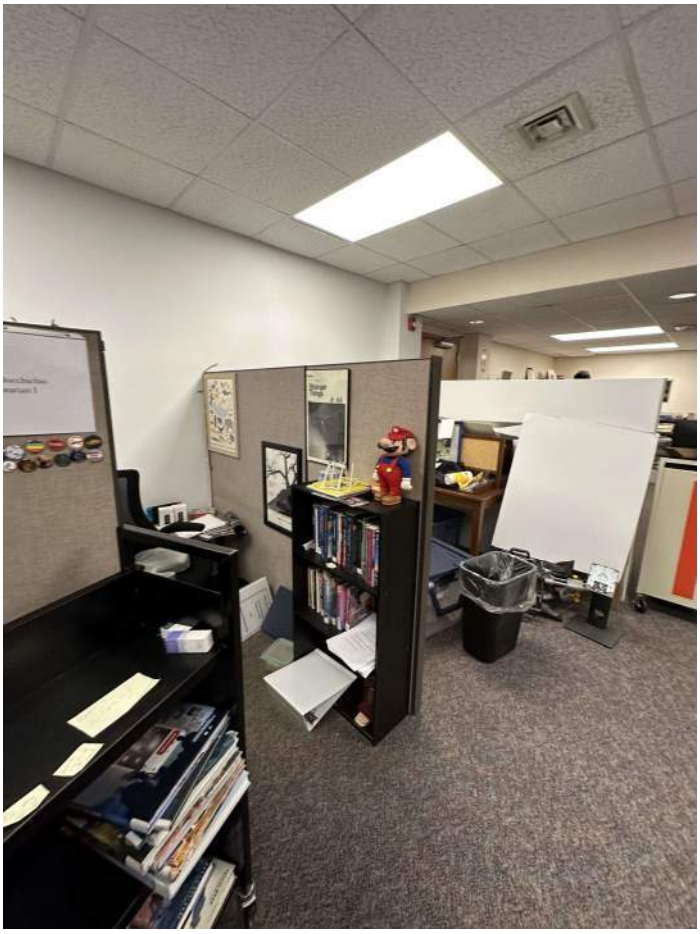

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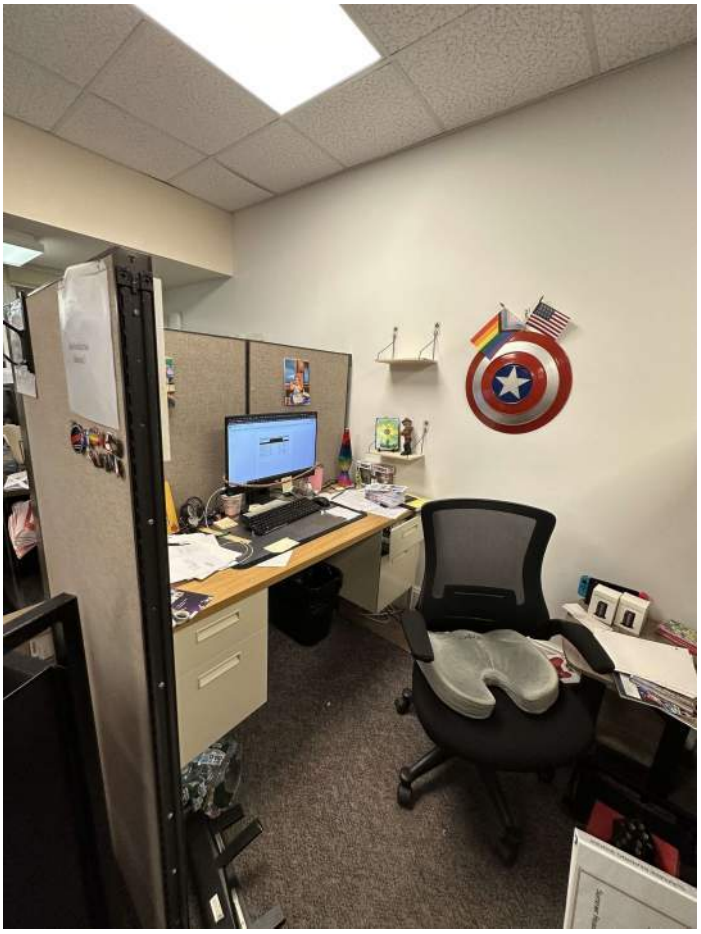

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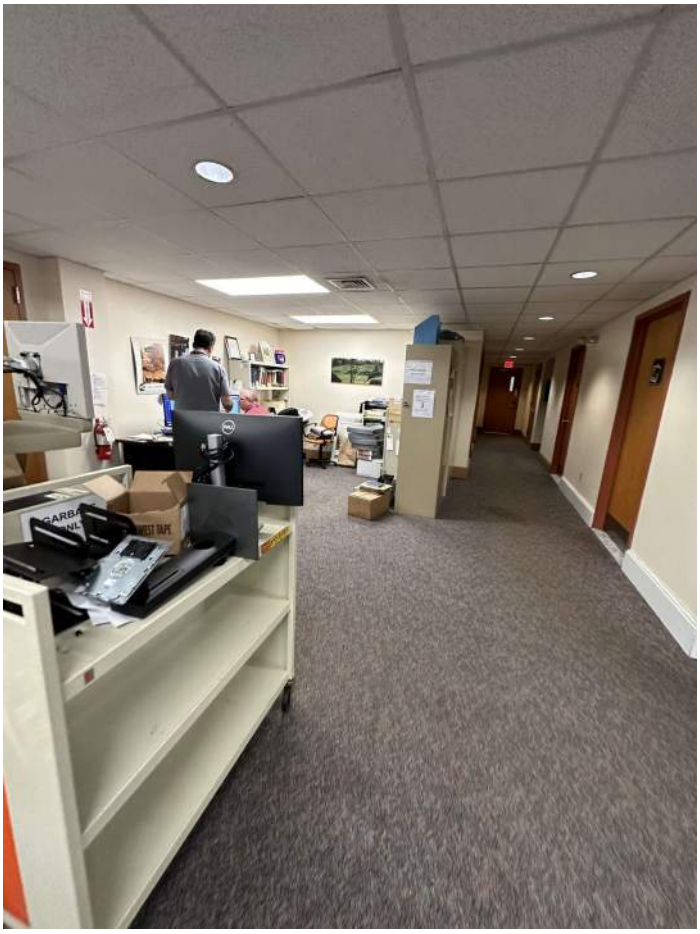

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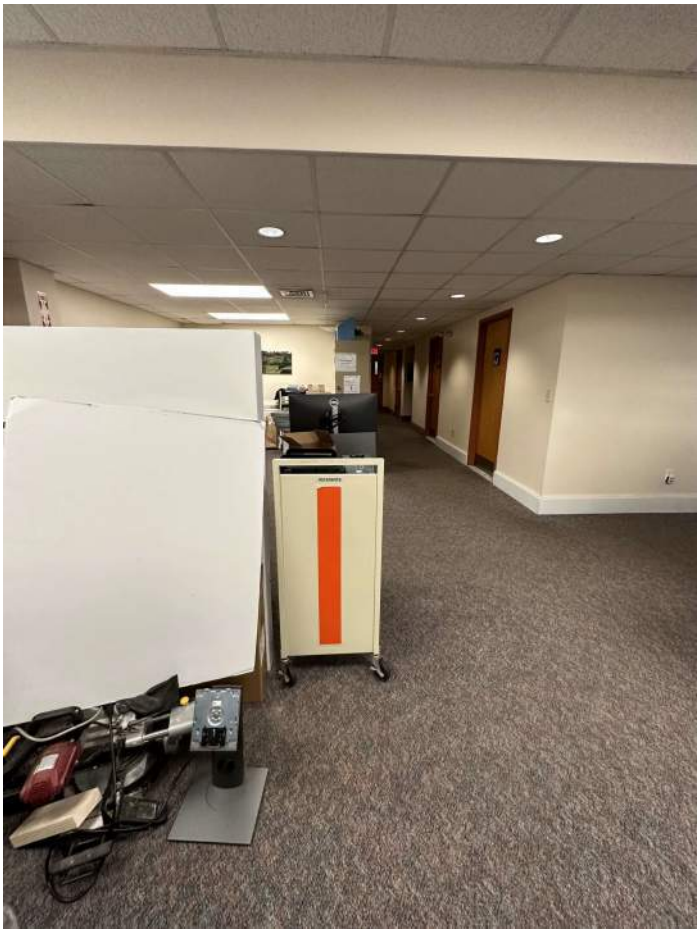

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INTERIOR FICTION AND NONFICTION AREAS
AUGUST 2023

Lothrop Associates Architects D.P.C.

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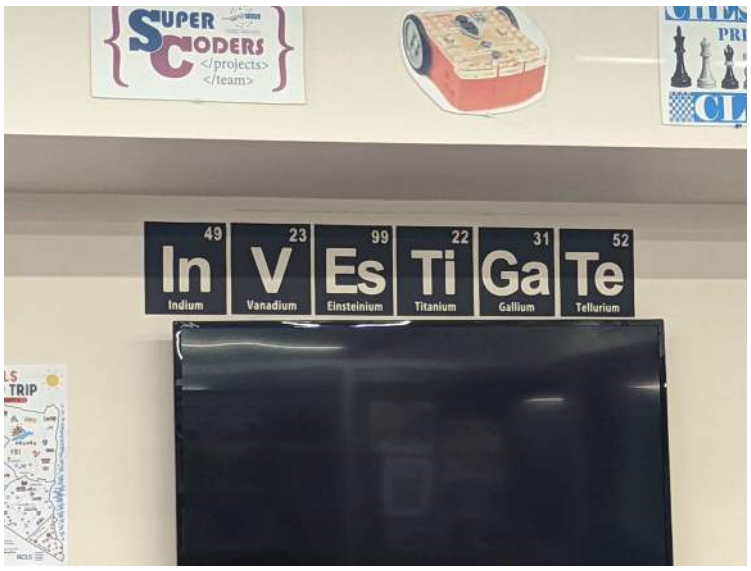

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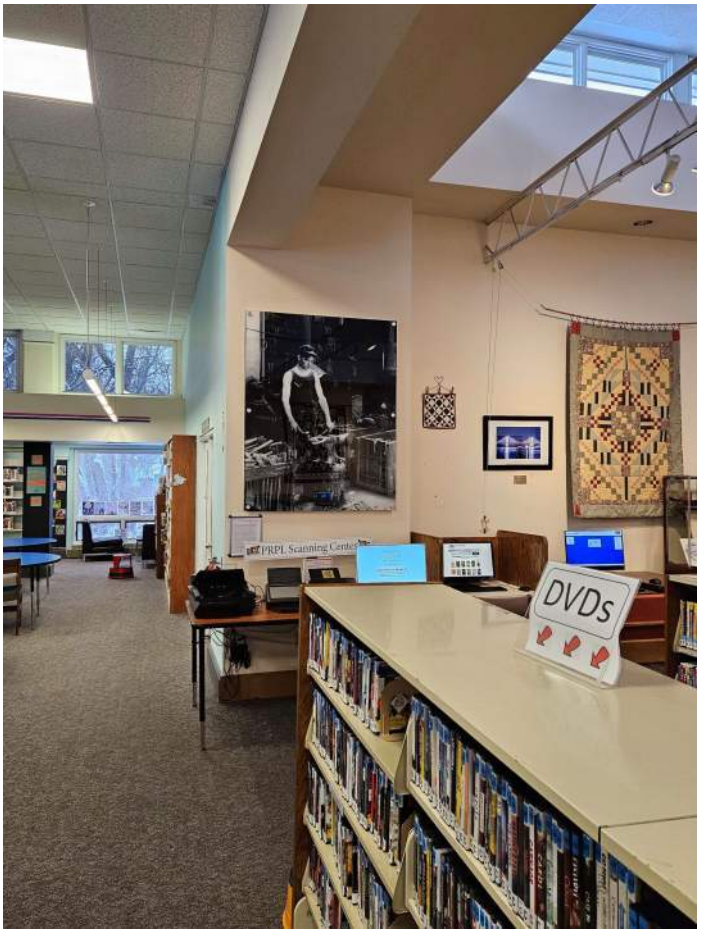
SOFFITS
JANUARY 2024

Lothrop Associates Architects D.P.C.

2578-02_24_0119 - 8001 - SOFFIT.JPG



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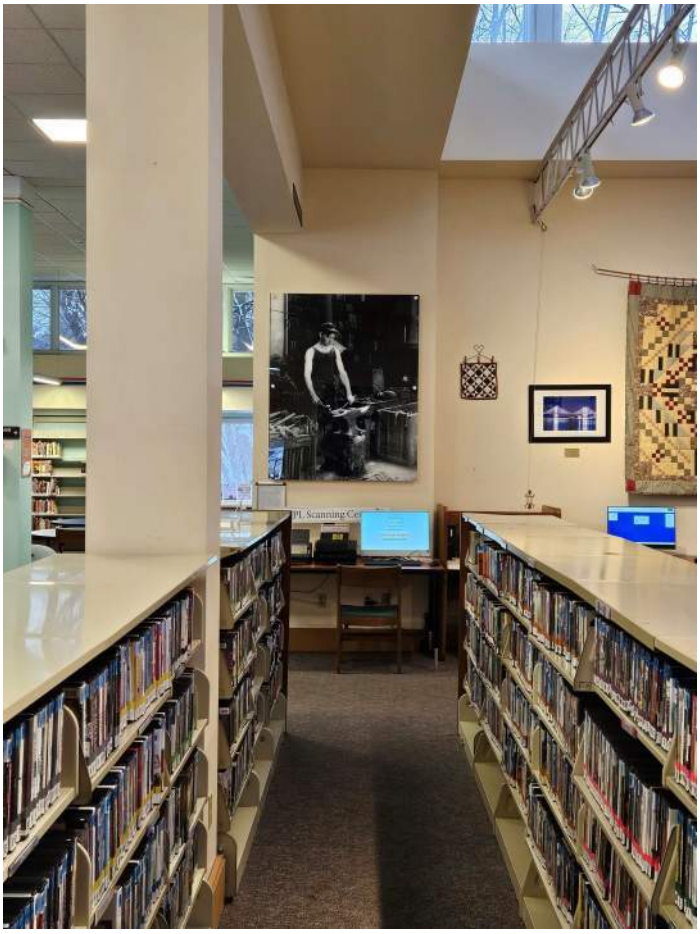

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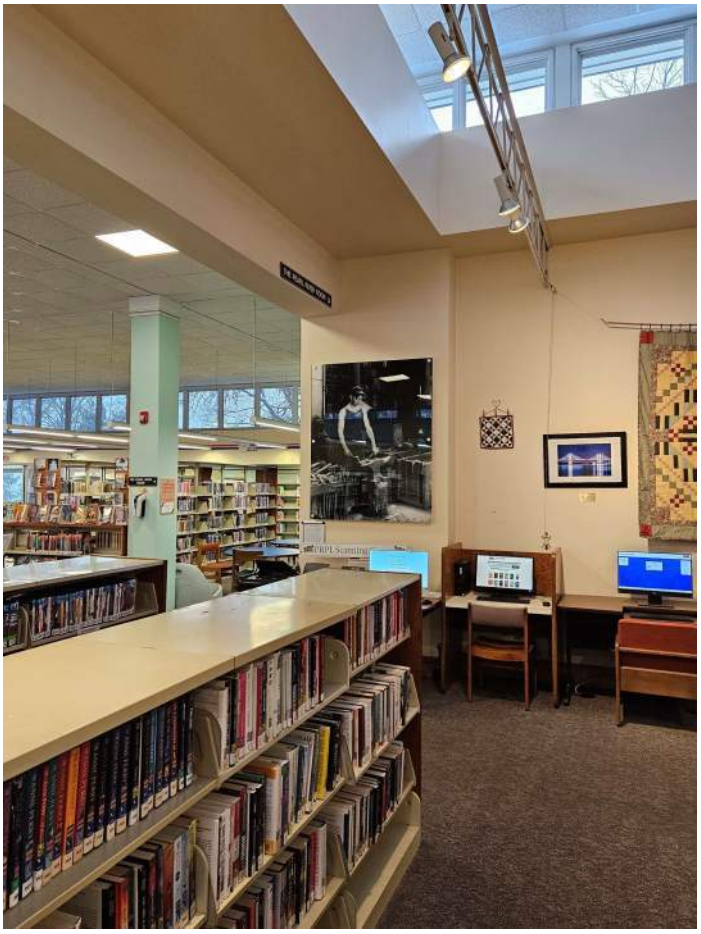

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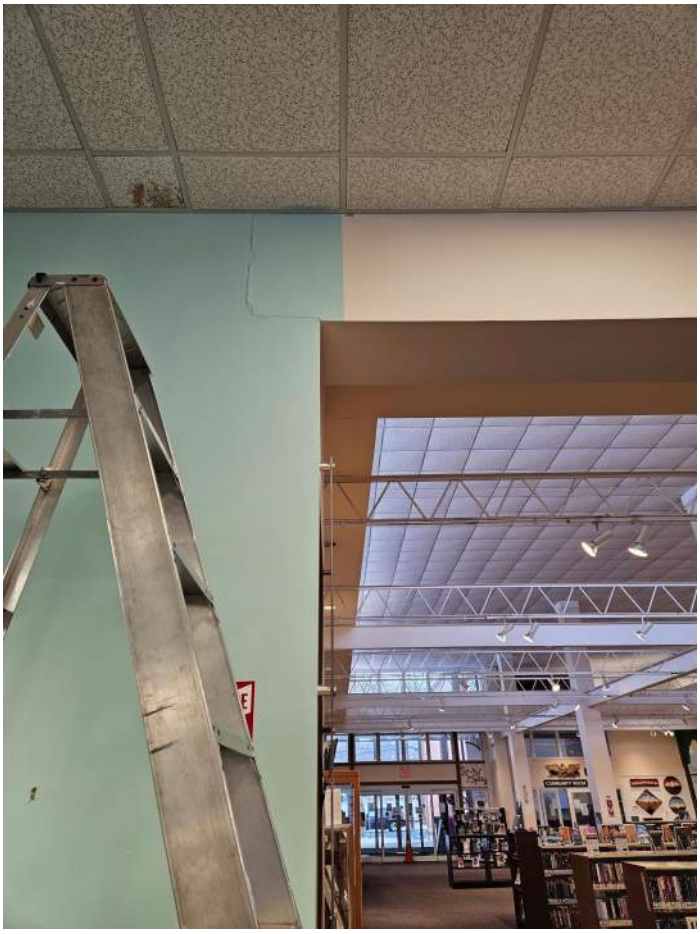

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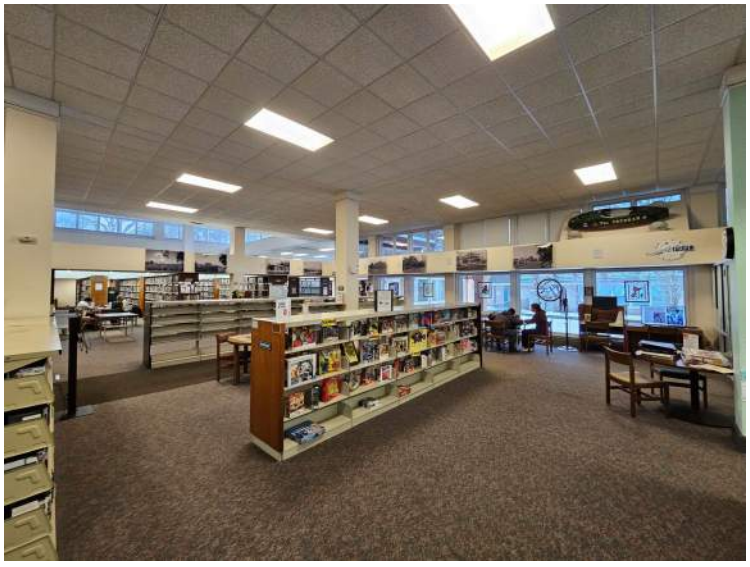

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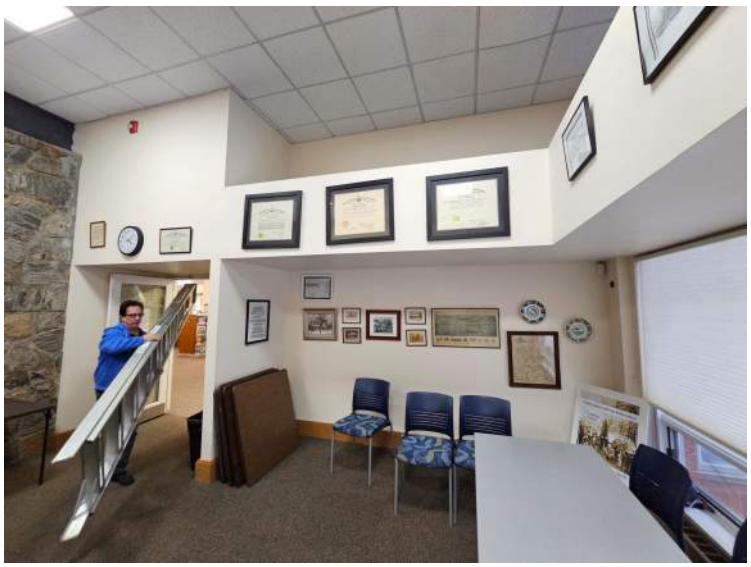

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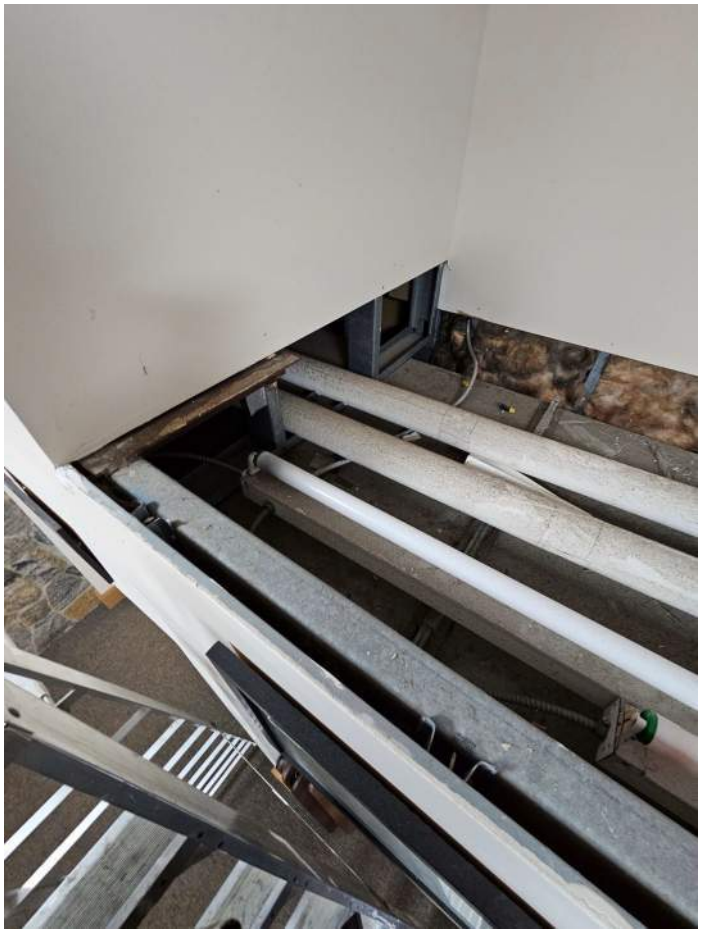

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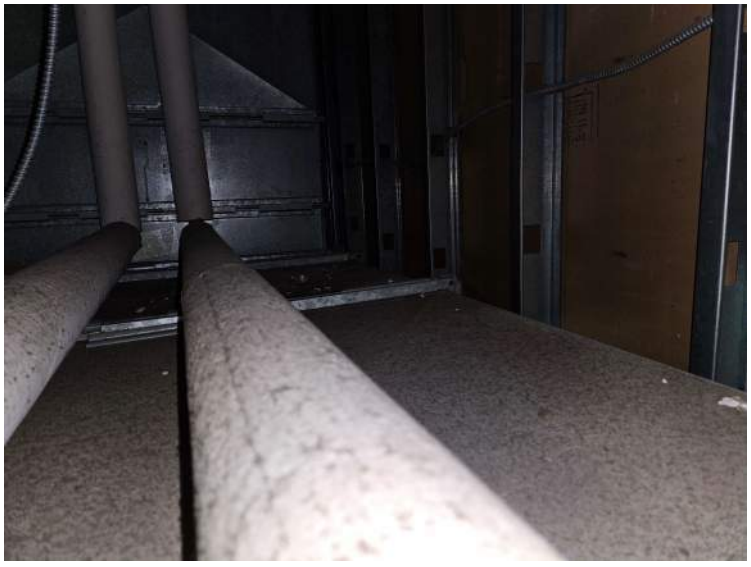

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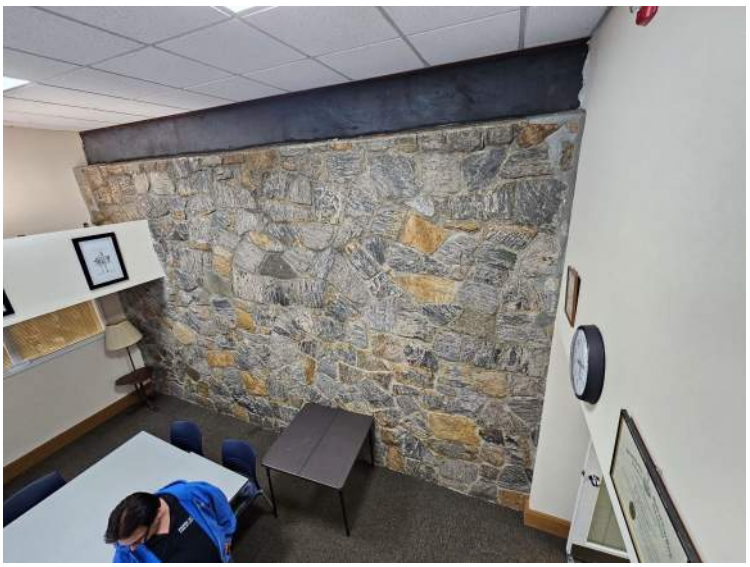

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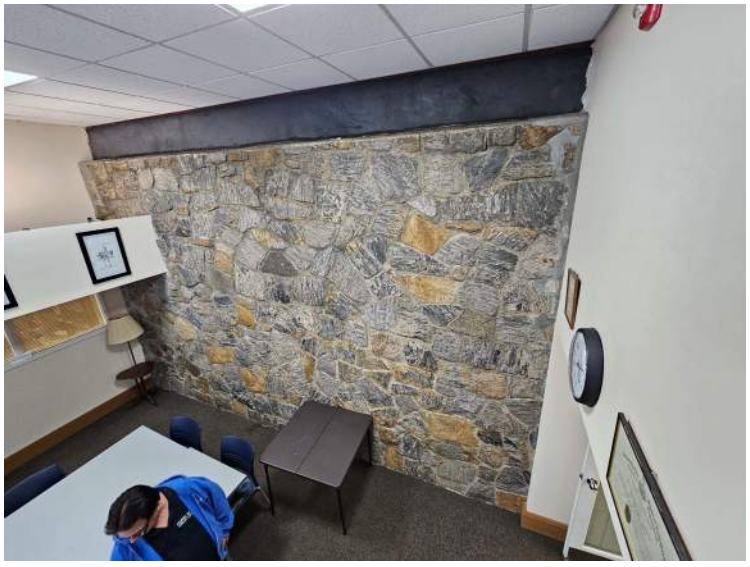

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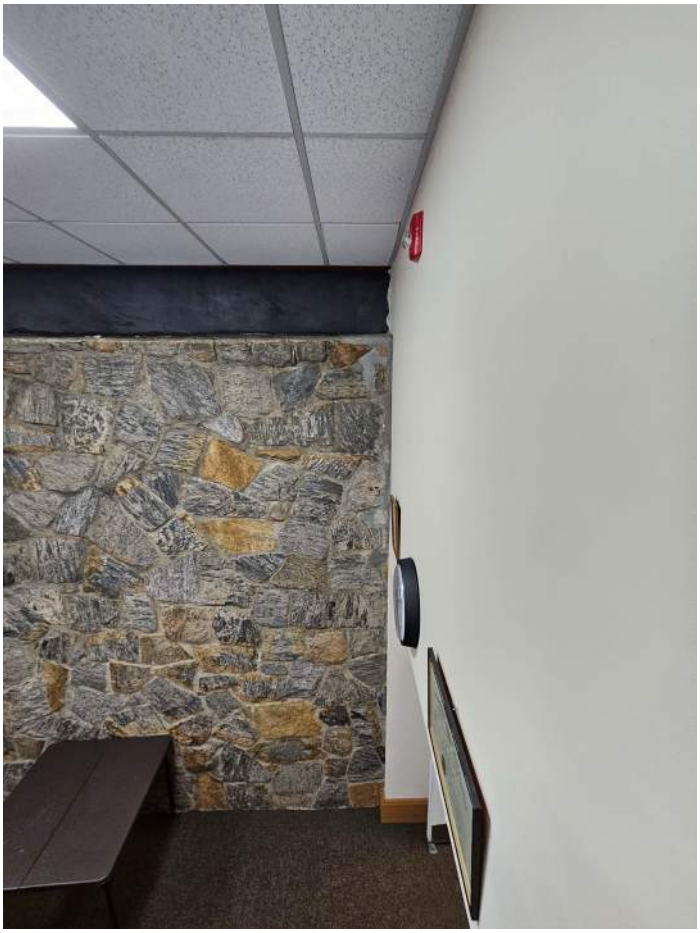

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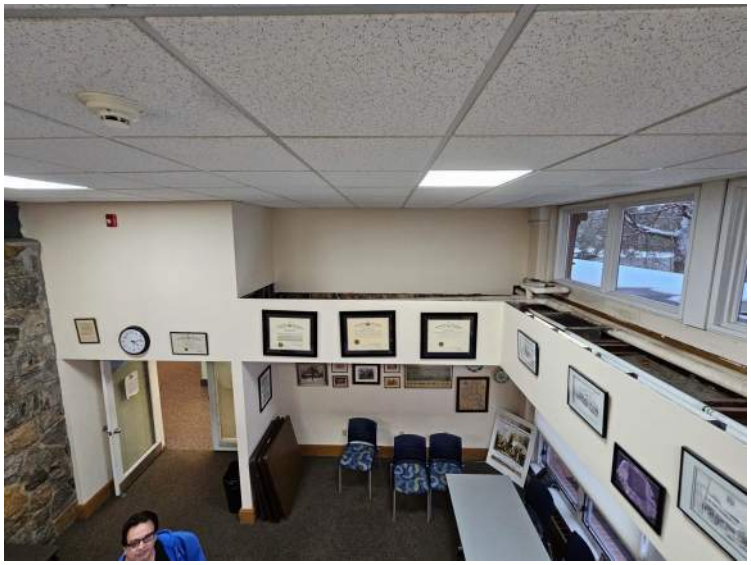

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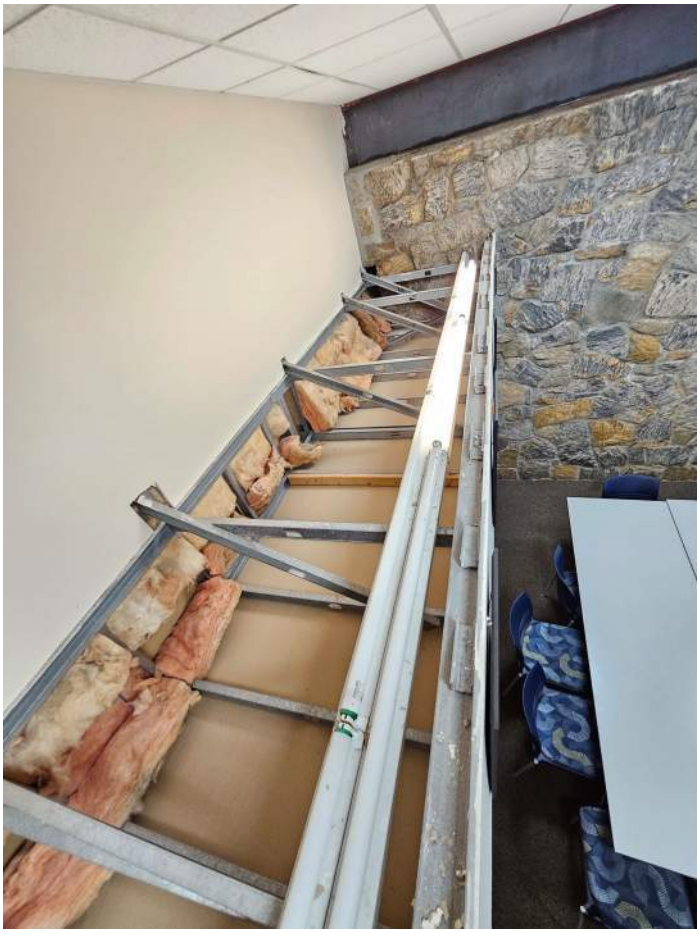

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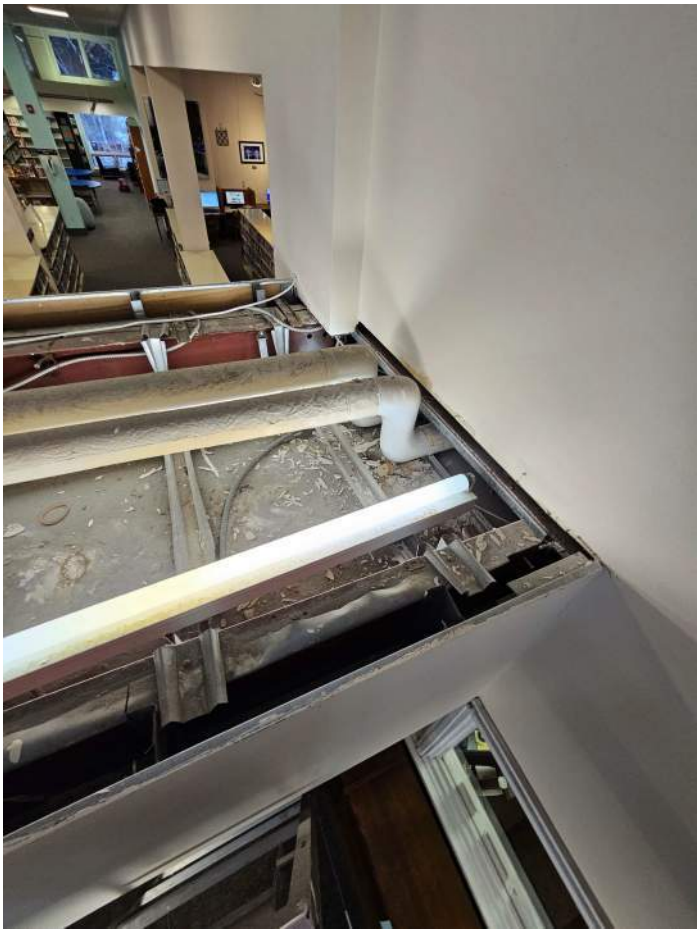

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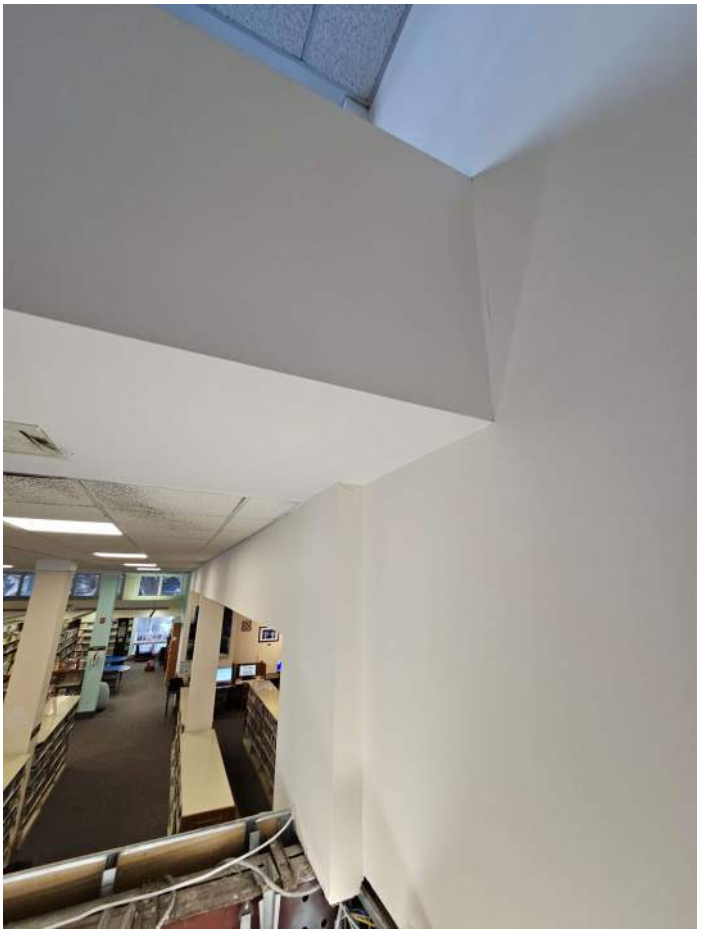

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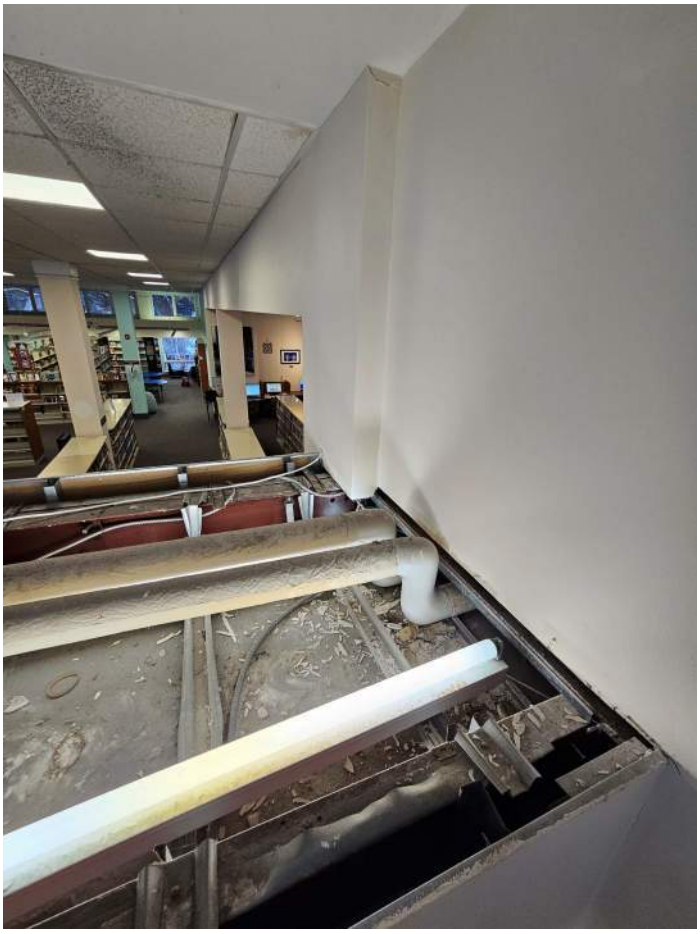

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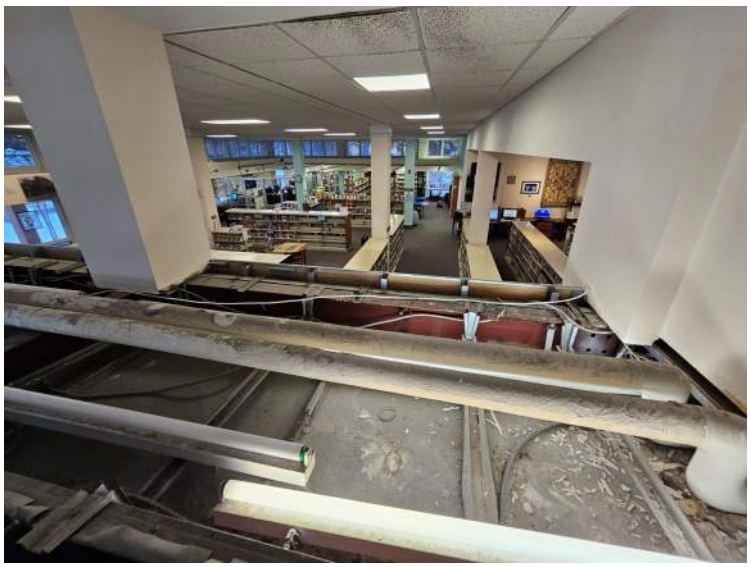

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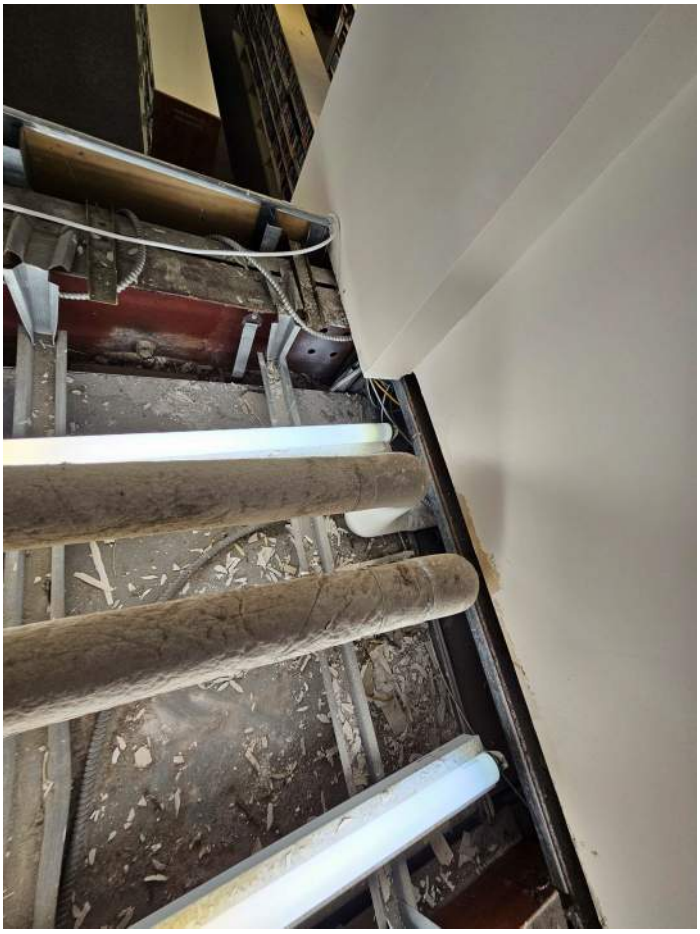

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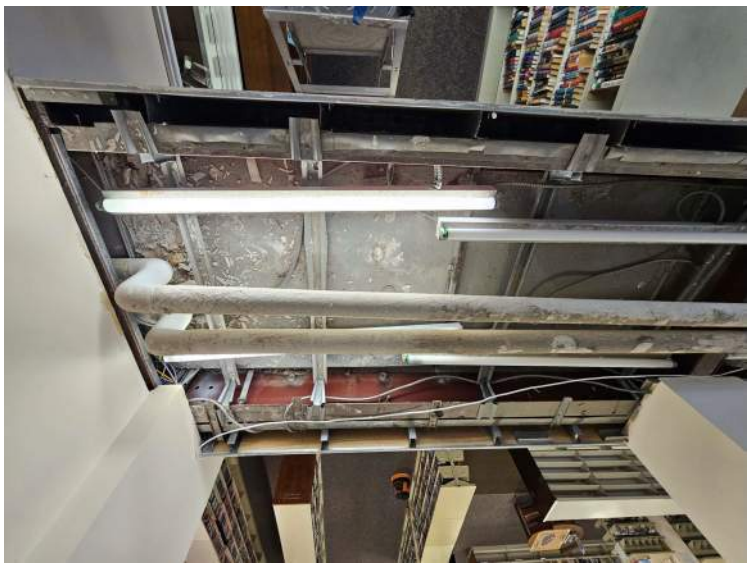

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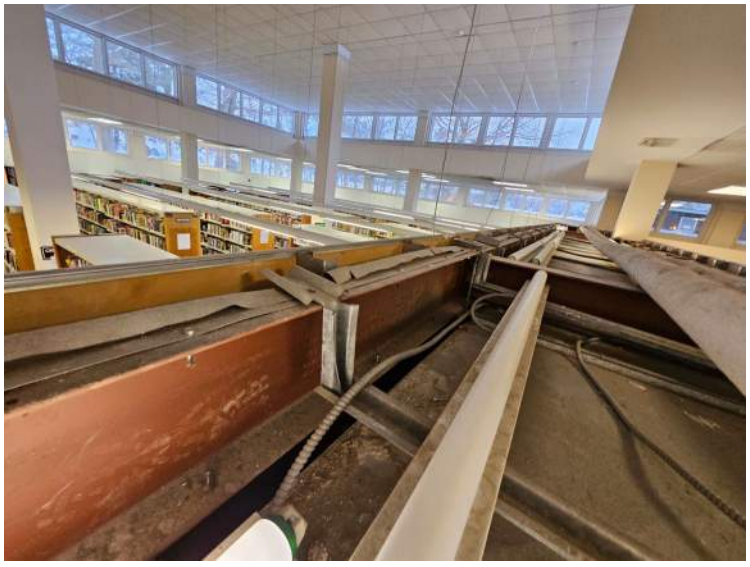

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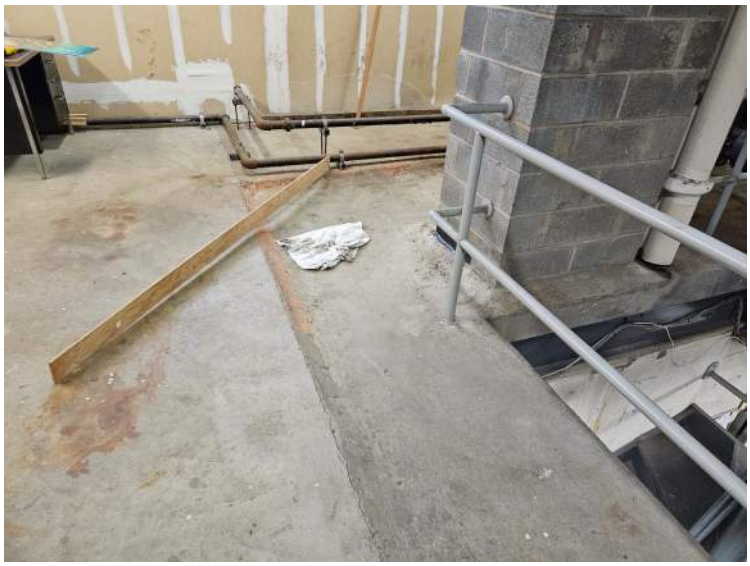

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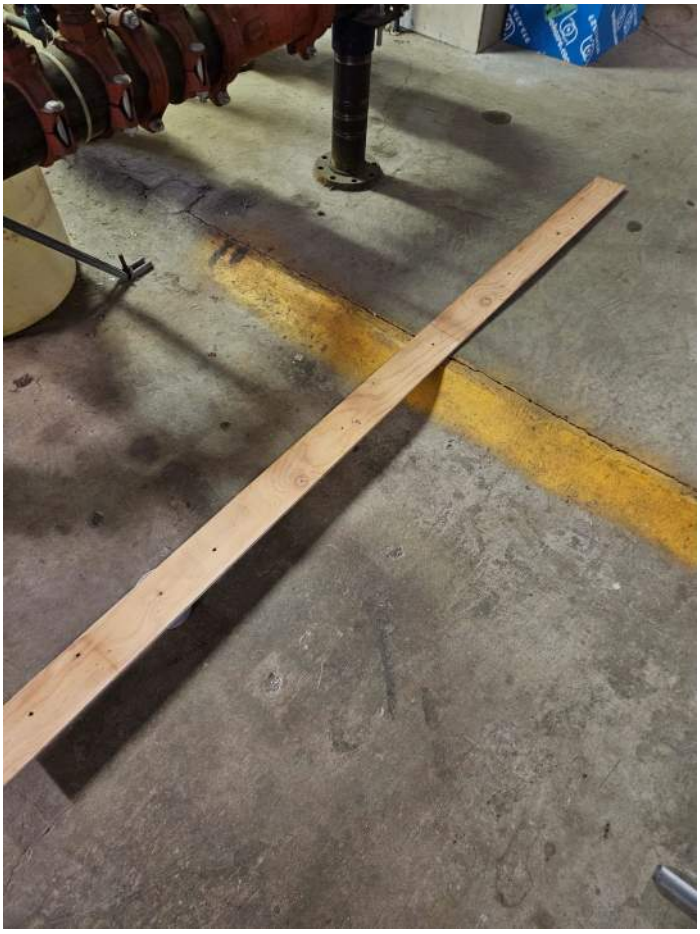

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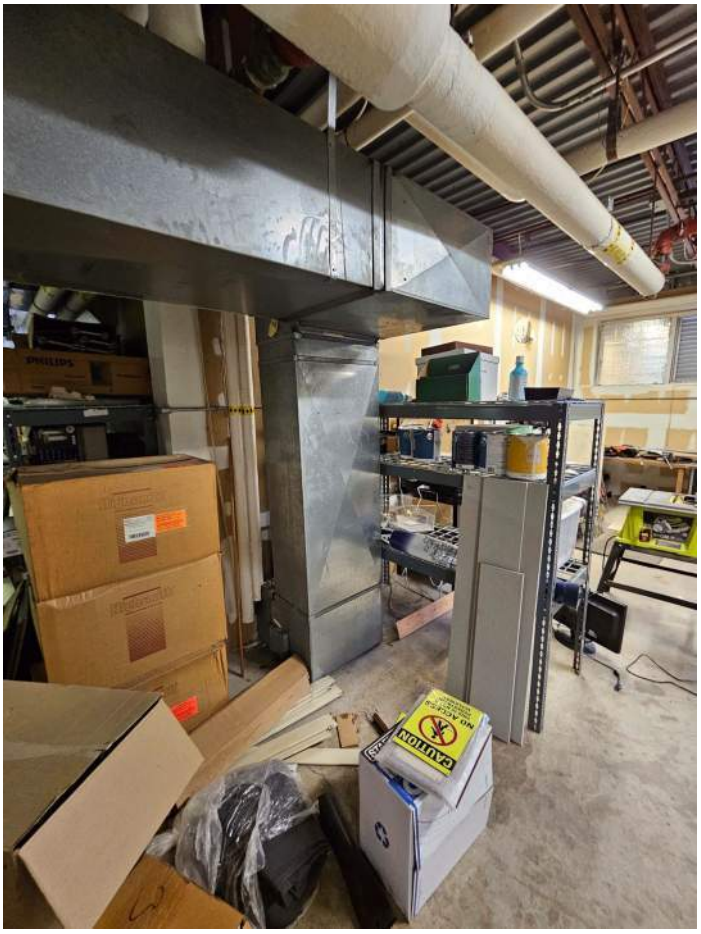

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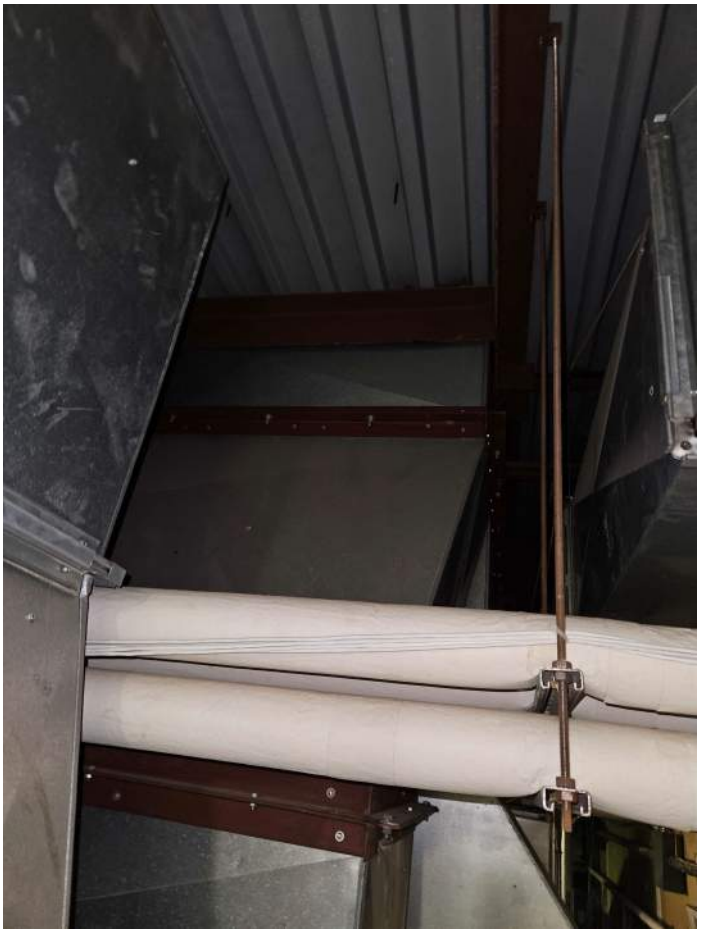

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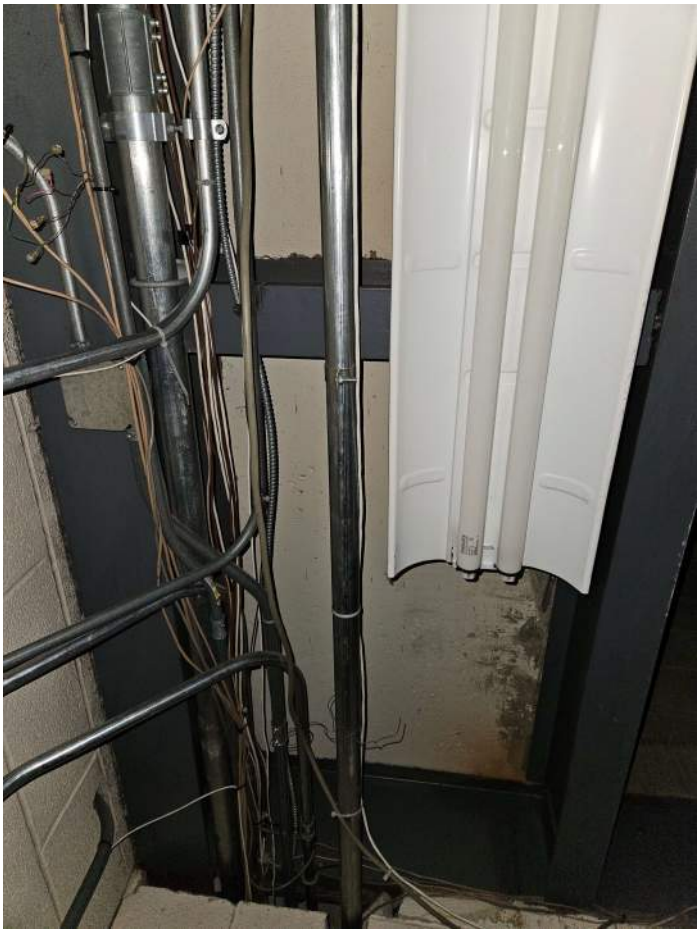

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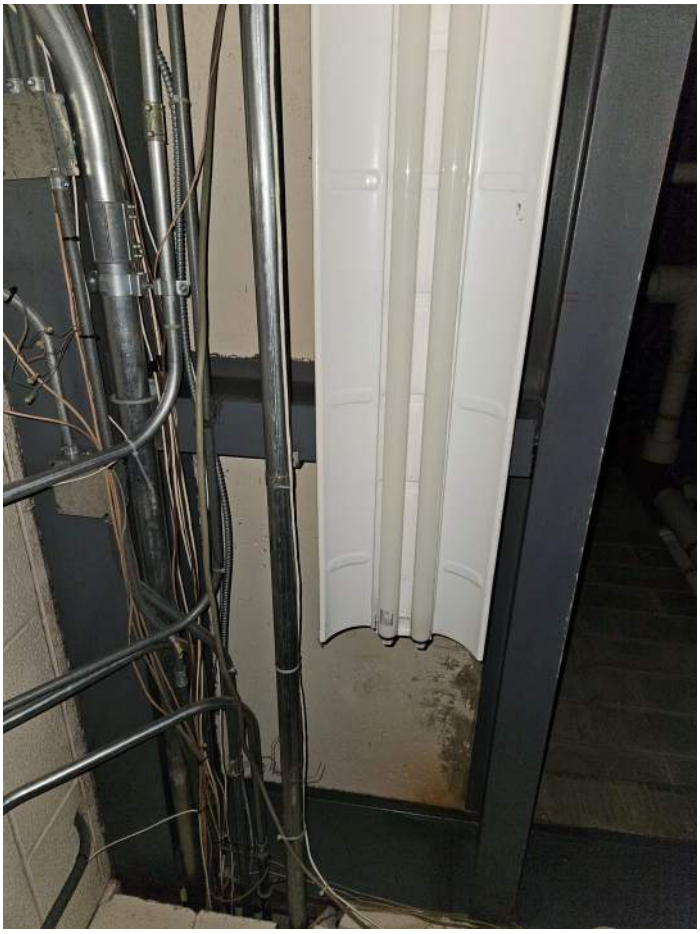

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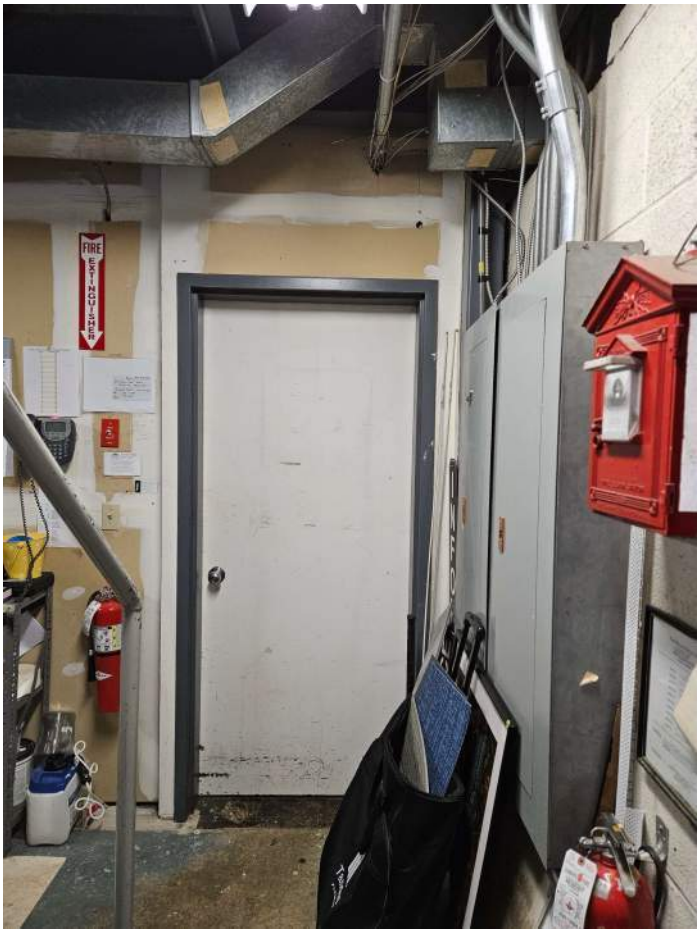

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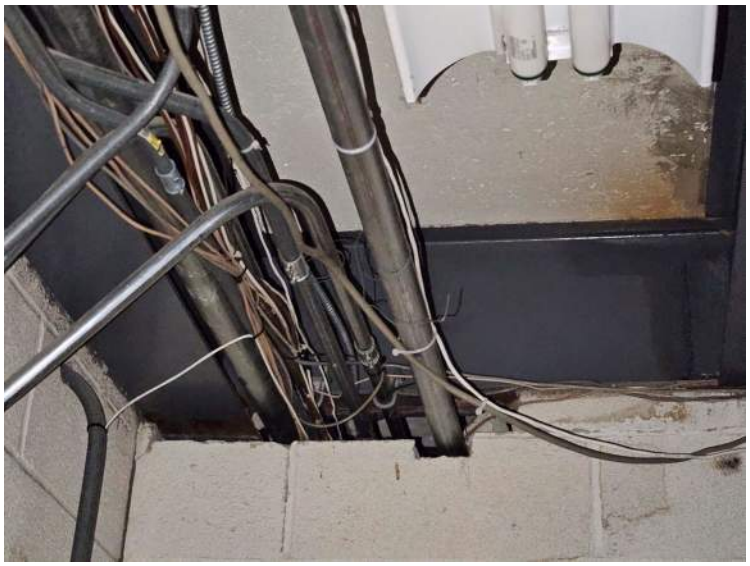

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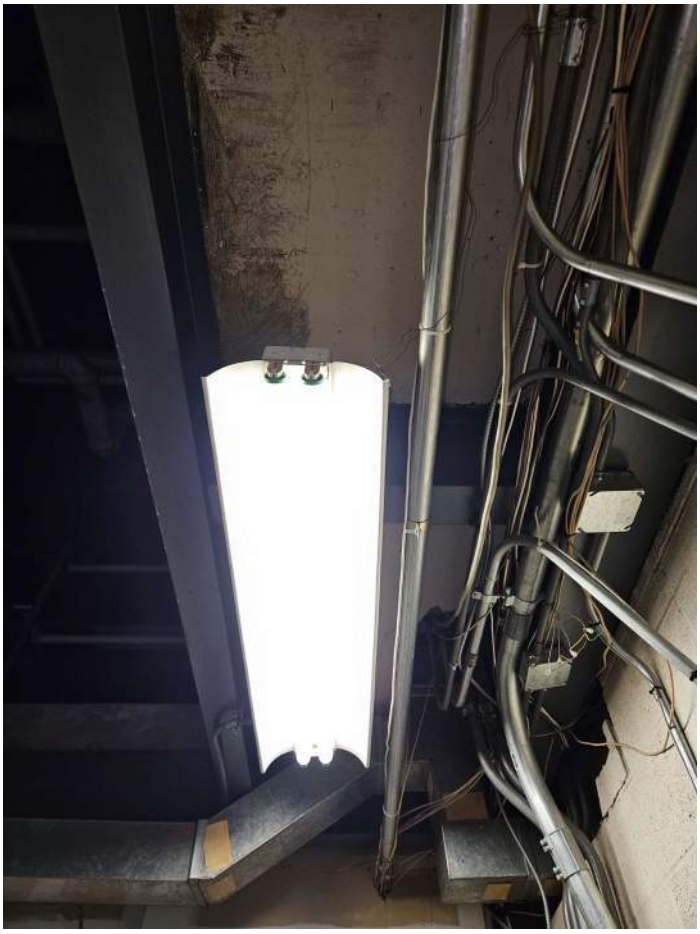

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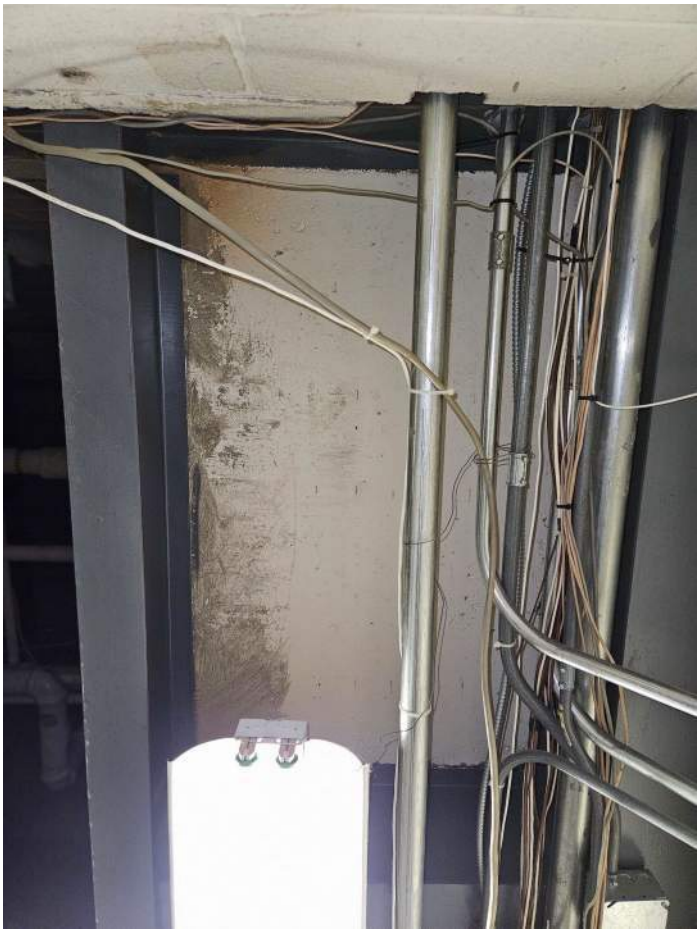

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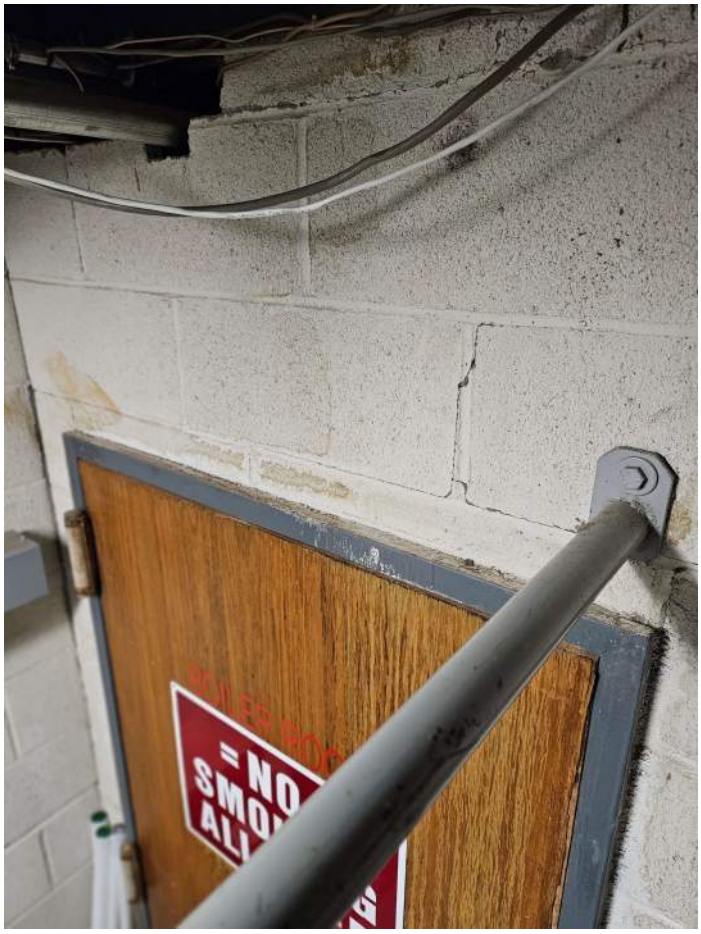

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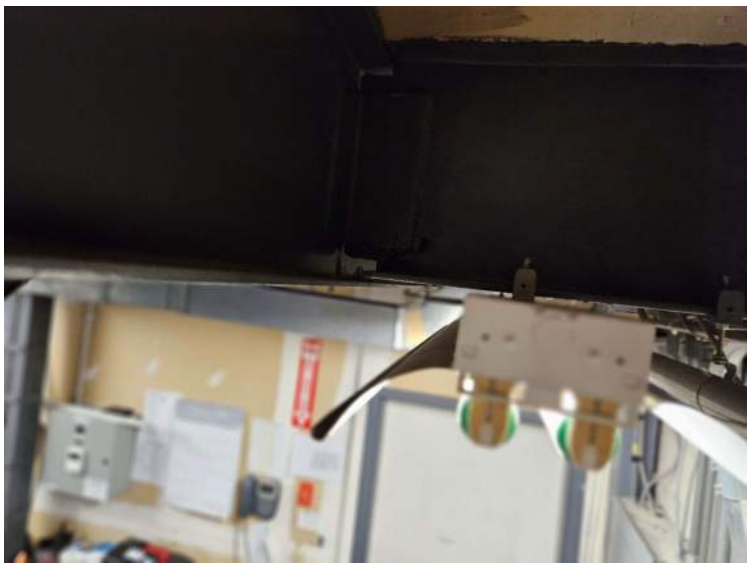

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2578-02_24_0119 - 8819 - SOFFIT.JPG

2578-02_24_0119 - 8821 - SOFFIT.JPG

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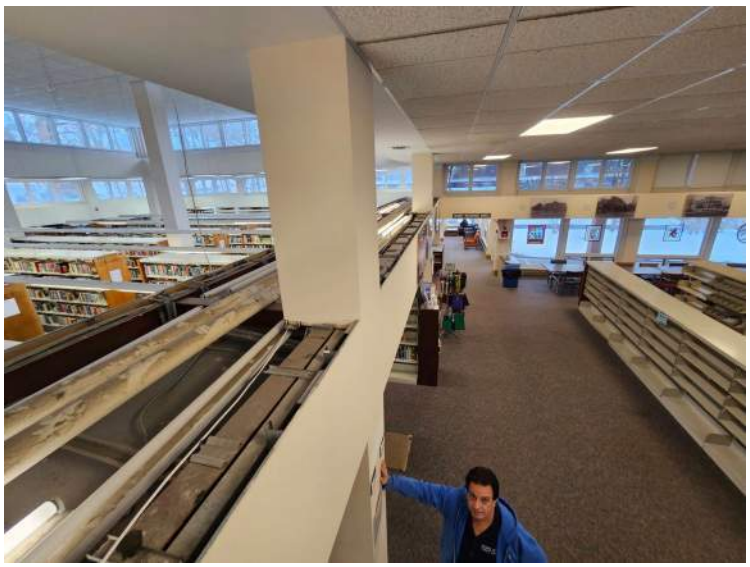

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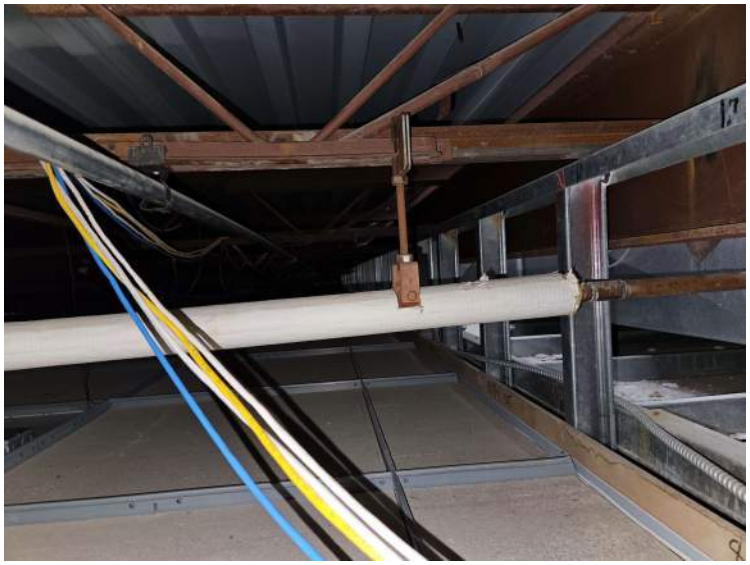

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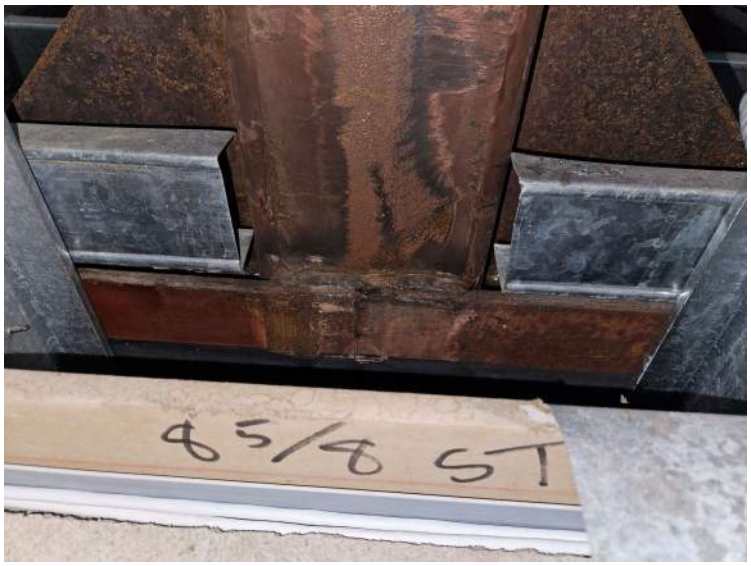

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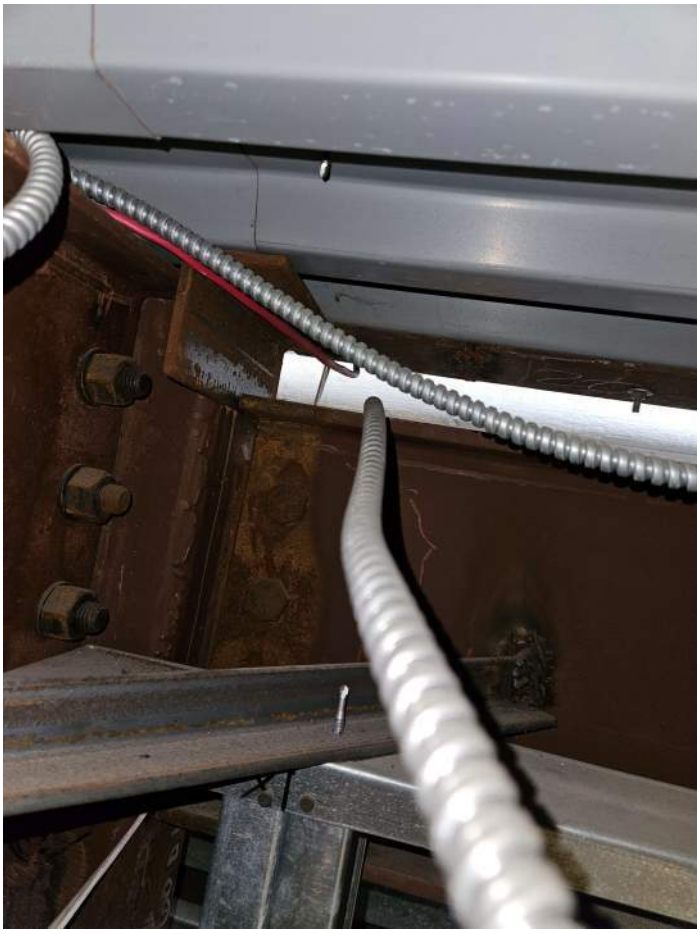

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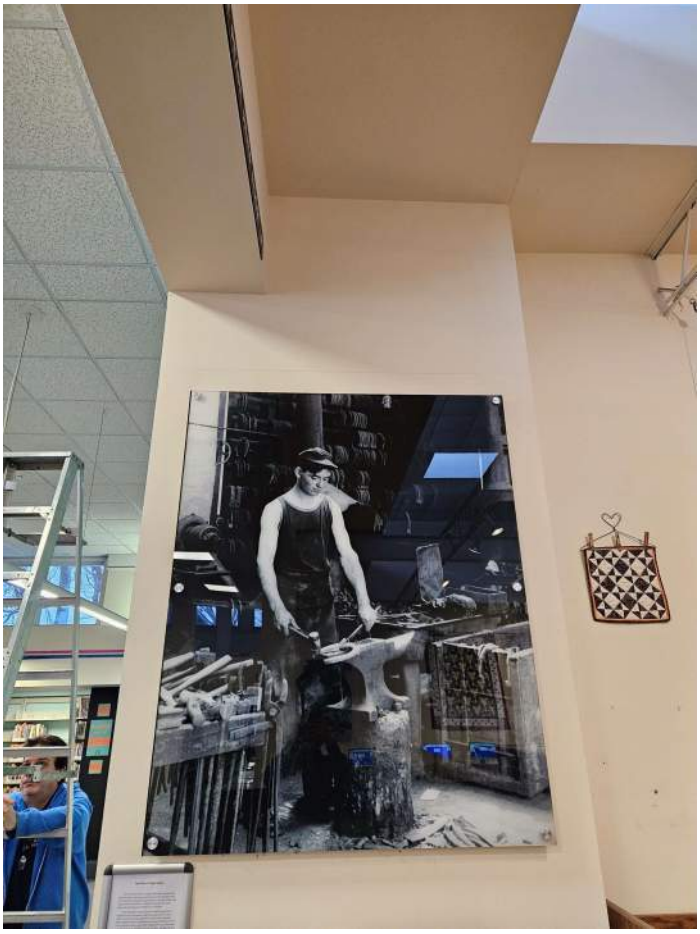

2578-02_24_0119 - 8899 - SOFFIT.JPG

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SOFFITS
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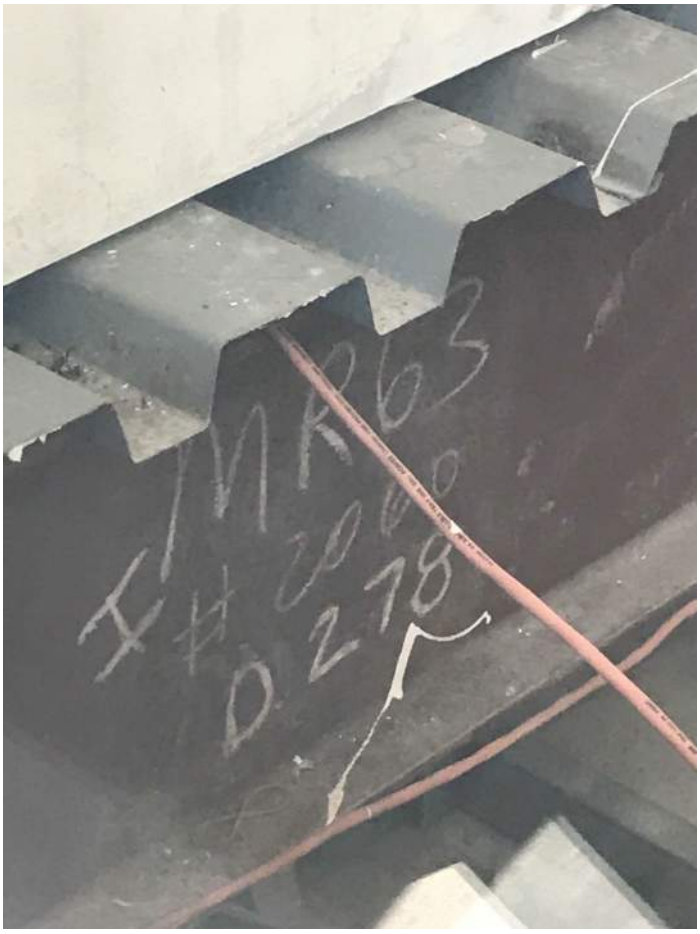
2578-02_24_0127 - HIGH CLERESTORY - ATRIUM NW TO NE (KS) (3823).J...

2578-02_24_0127 - HIGH CLERESTORY - ATRIUM SOFFIT N+W (LOOKING ...

2578-02_24_0127 - HIGH CLERESTORY - ATRIUM SOFFIT N SIDE (LOOKIN...

2578-02_24_0127 - HIGH CLERESTORY - ATRIUM SW TO SE (KS) (3827).JPG



2578-02_24_0127 - HIGH CLERESTORY - NF - W SIDE DETAIL (KS)(3829)....

2578-02_24_0127 - HIGH CLERESTORY - NF -SE LOOKING NW (KS).JPG

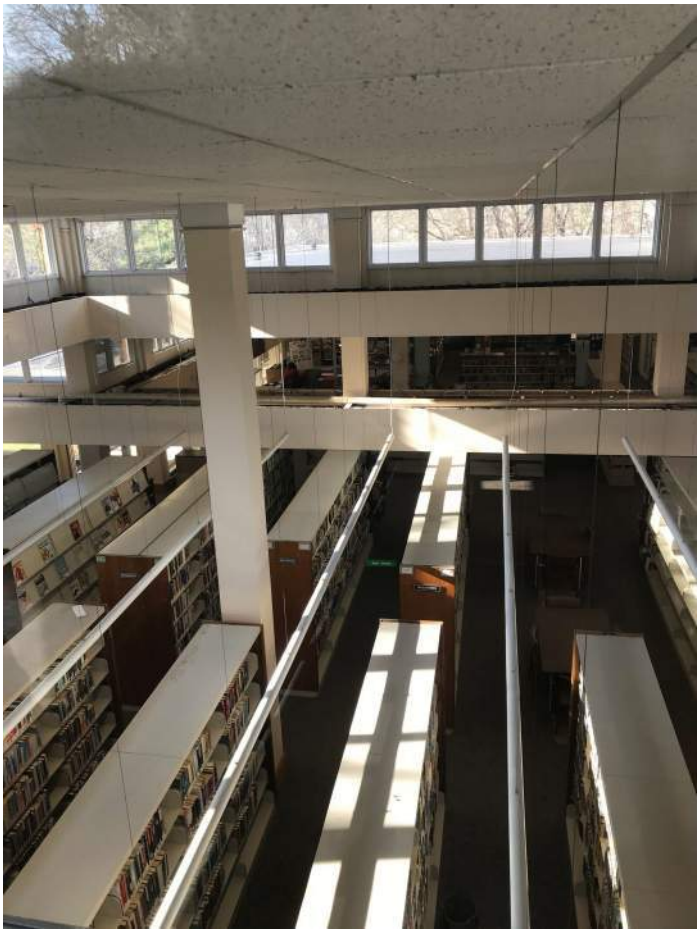
2578-02_24_0127 - HIGH CLERESTORY - NF - W SIDE(KS) (3830).JPG

2578-02_24_0127 - HIGH CLERESTORY - NF -SE TO N (KS).JPG

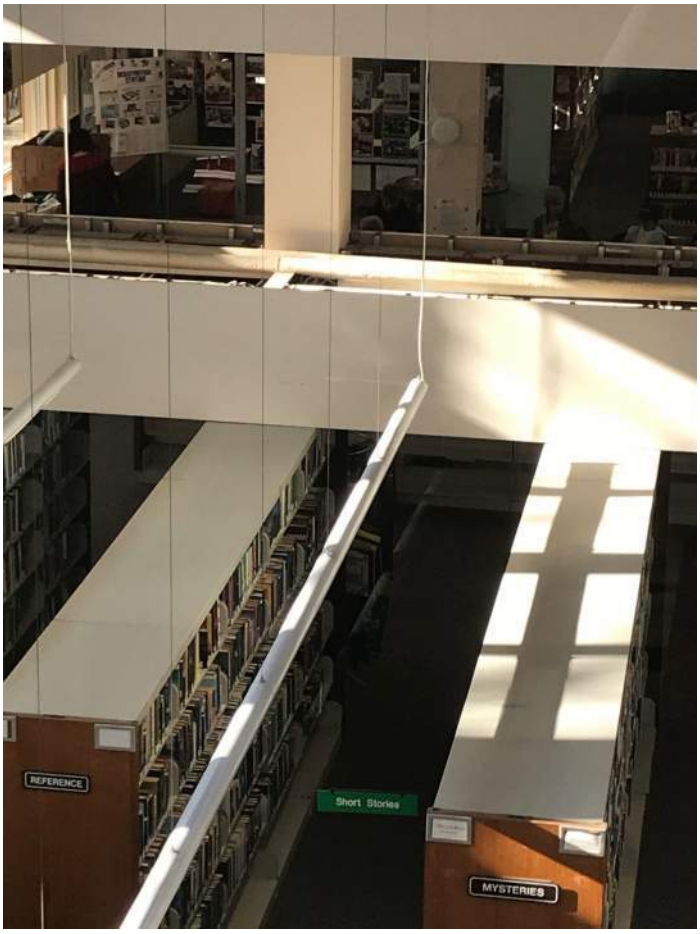
2578-02_24_0127 - HIGH CLERESTORY - NF -SE TO NE (KS).JPG

2578-02_24_0127 - HIGH CLERESTORY - NF -SE TO SW DETAIL(KS).JPG

2578-02_24_0127 - HIGH CLERESTORY - NF -SE TO SW (KS).JPG



2578-02_24_0127 - HIGH CLERESTORY - NF W SIDE STACKED(KS).JPG



2578-02_24_0127 - LOW CLERESTORY - NF W SIDE STACKED(KS).JPG

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P-COLUMN LINE
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2578-02_24_0131 - 9301 - P-COL (BG).JPG

2578-02_24_0131 - 9303 - P-COL (BG).JPG

2578-02_24_0131 - 9302 - P-COL (BG).JPG

2578-02_24_0131 - 9304 - P-COL (BG).JPG

2578-02_24_0131 - 9305 - P-COL (BG).JPG

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2578-02_24_0131 - 9311 - P-COL (BG).JPG

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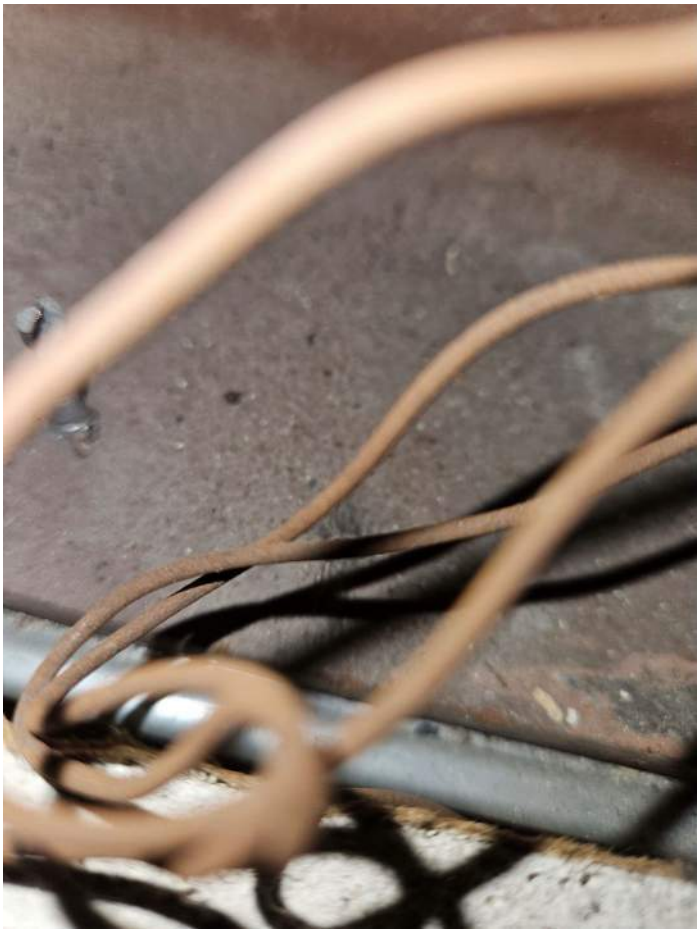
2578-02_24_0131 - 9315 - P-COL (BG).JPG



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2578-02_24_0131 - 9333 - P-COL (BG).JPG

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ATRIUM
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2578-02_24_0205 - 9601 - ATRIUM (BG).JPG

2578-02_24_0205 - 9603 - ATRIUM (BG).JPG

2578-02_24_0205 - 9602 - ATRIUM (BG).JPG

2578-02_24_0205 - 9604 - ATRIUM (BG).JPG

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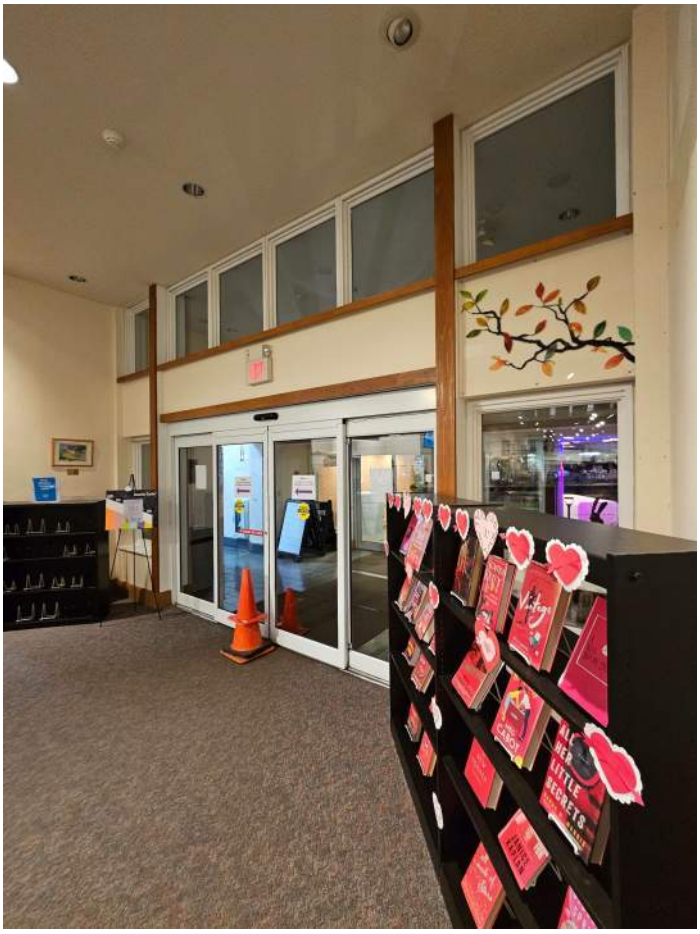
2578-02_24_0205 - 9607 - ATRIUM (BG).JPG



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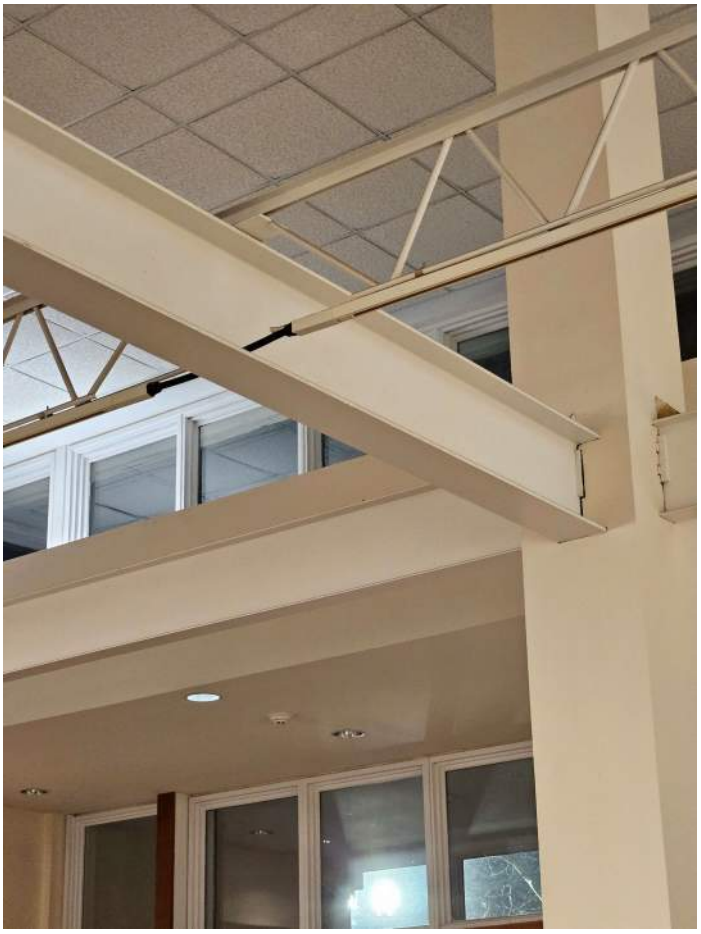
2578-02_24_0205 - 9610 - ATRIUM (BG).JPG

2578-02_24_0205 - 9612 - ATRIUM (BG).JPG

2578-02_24_0205 - 9613 - ATRIUM (BG).JPG



2578-02_24_0205 - 9615 - ATRIUM (BG).JPG

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2578-02_24_0205 - 9616 - ATRIUM (BG).JPG

2578-02_24_0205 - 9617 - ATRIUM (BG).JPG

2578-02_24_0205 - 9618 - ATRIUM (BG).JPG

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COLUMN LINE F
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2578-02_24_0205 - 9401 - COLUMN F-10 (BG).JPG

2578-02_24_0205 - 9403 - COLUMN F-10 (BG).JPG

2578-02_24_0205 - 9402 - COLUMN F-10 (BG).JPG

2578-02_24_0205 - 9404 - COLUMN F-10 (BG).JPG

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2578-02_24_0205 - 9514 - COLUMN F-10 (BG).JPG

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INTERIOR WINDOWS
FEBRUARY 2024

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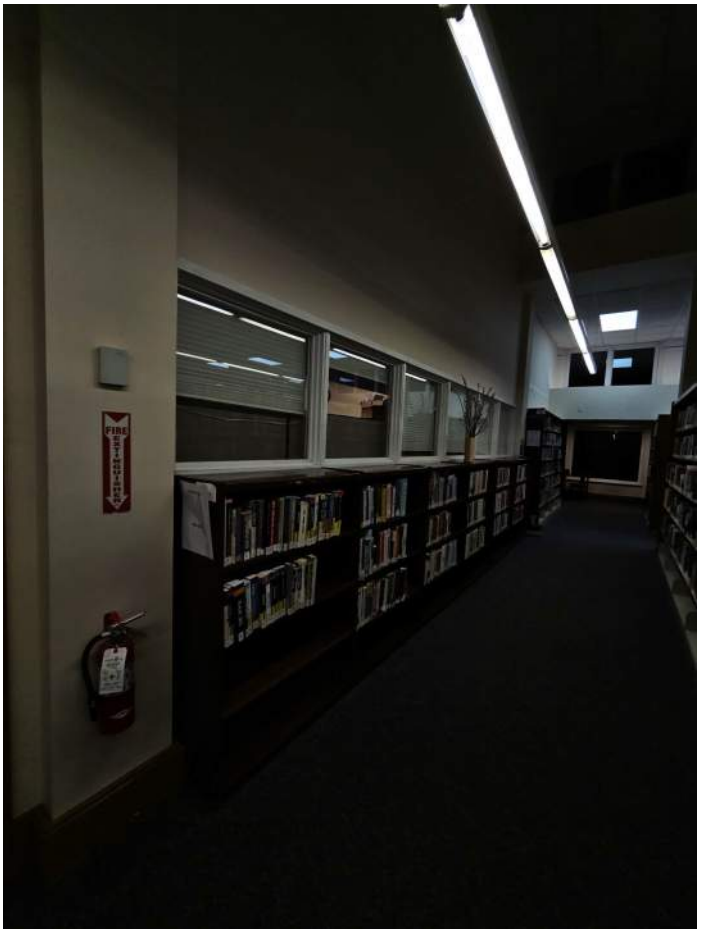
2578-02_24_0205 - 9801 - STAFF (BG).JPG



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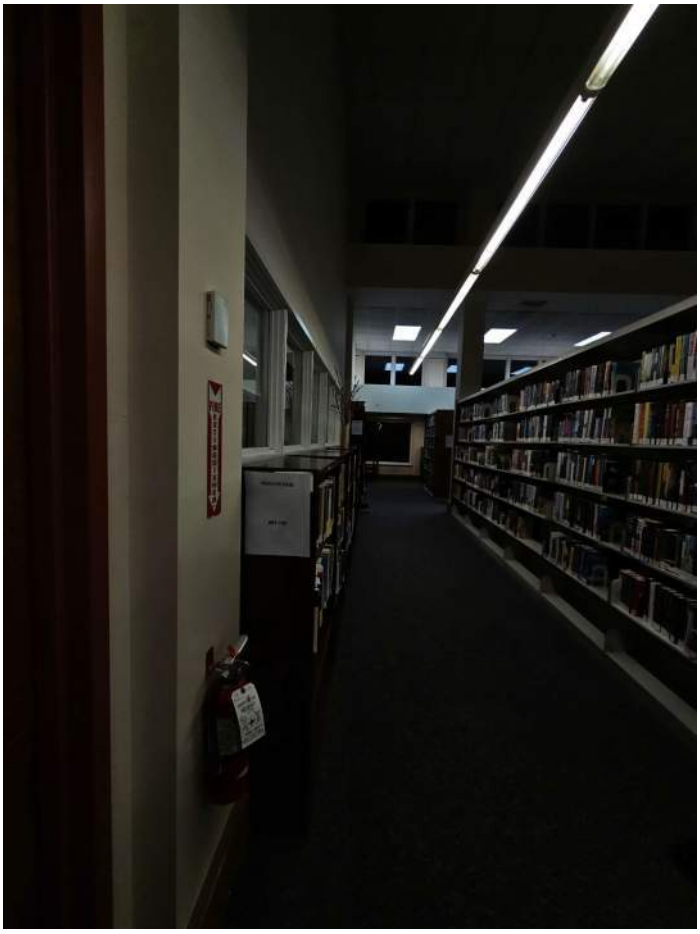
2578-02_24_0205 - 9803 - STAFF.JPG



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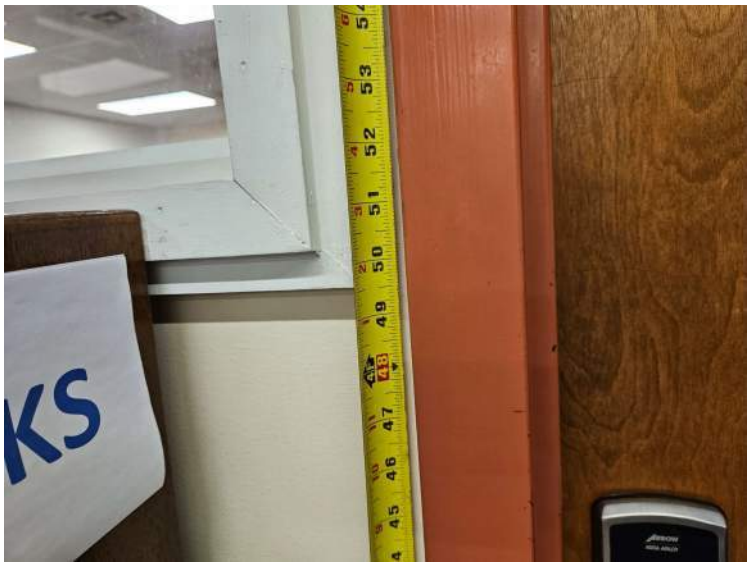

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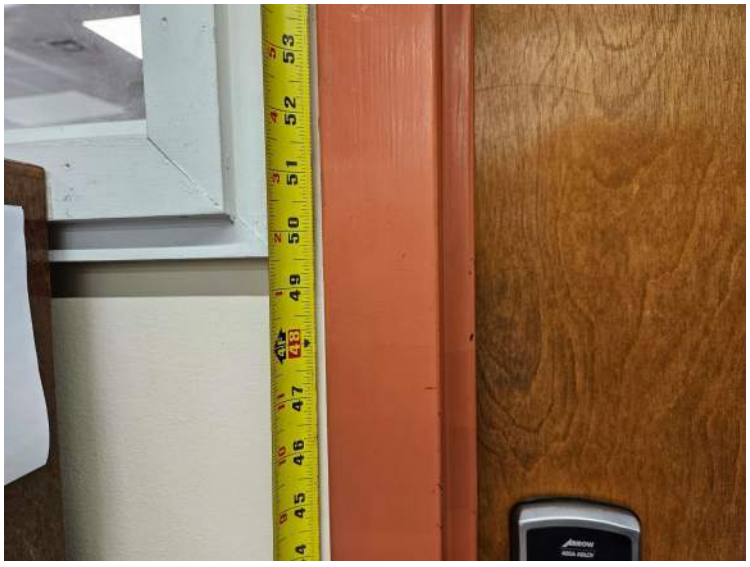
2578-02_24_0205 - 9809 - STAFF (BG).JPG



2578-02_24_0205 - 9808 - STAFF (BG).JPG

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2578-02_24_0306 - 2570.JPG

2578-02_24_0306 - 2572.JPG

2578-02_24_0306 - 2571.JPG

2578-02_24_0306 - 2573.JPG

2578-02_24_0306 - 2574.JPG

2578-02_24_0306 - 2576.JPG

2578-02_24_0306 - 2575.JPG

2578-02_24_0306 - 2577.JPG

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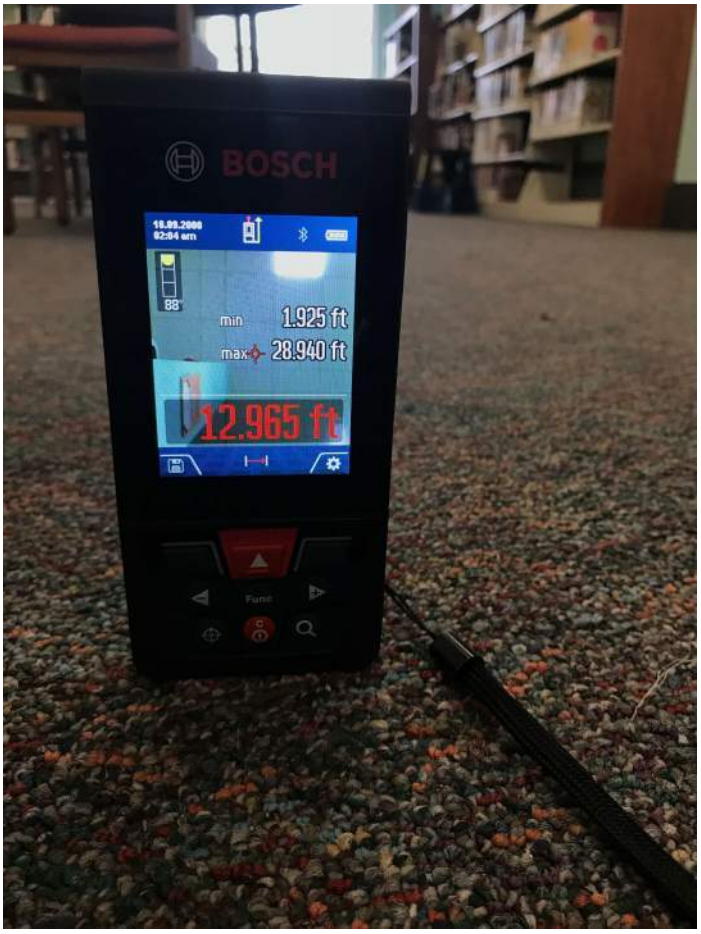
2578-02_24_0306 - 2580.JPG

2578-02_24_0306 - 2579.JPG



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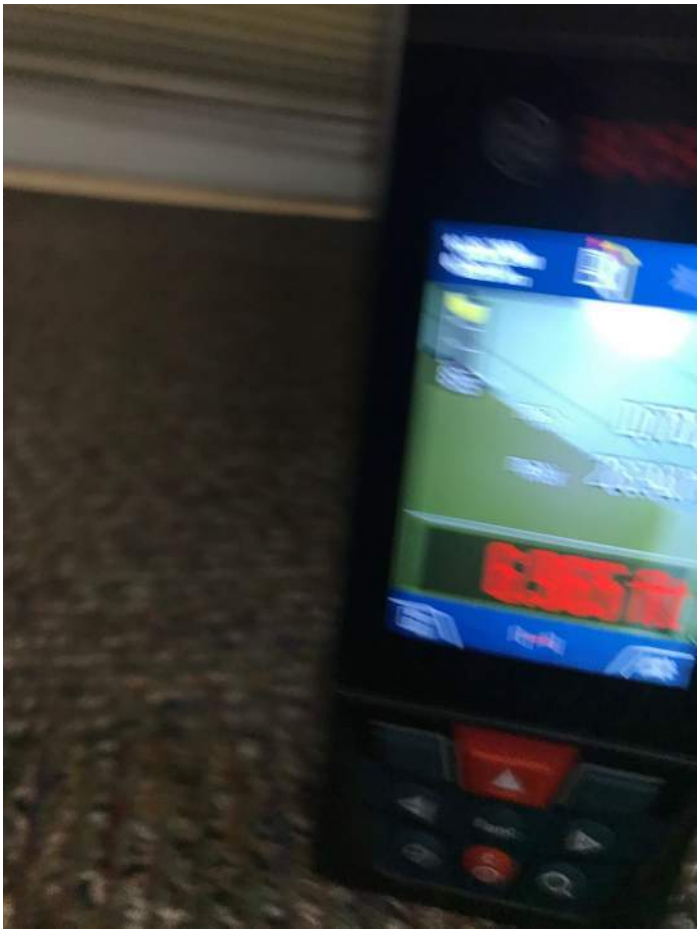
2578-02_24_0306 - 2585.JPG



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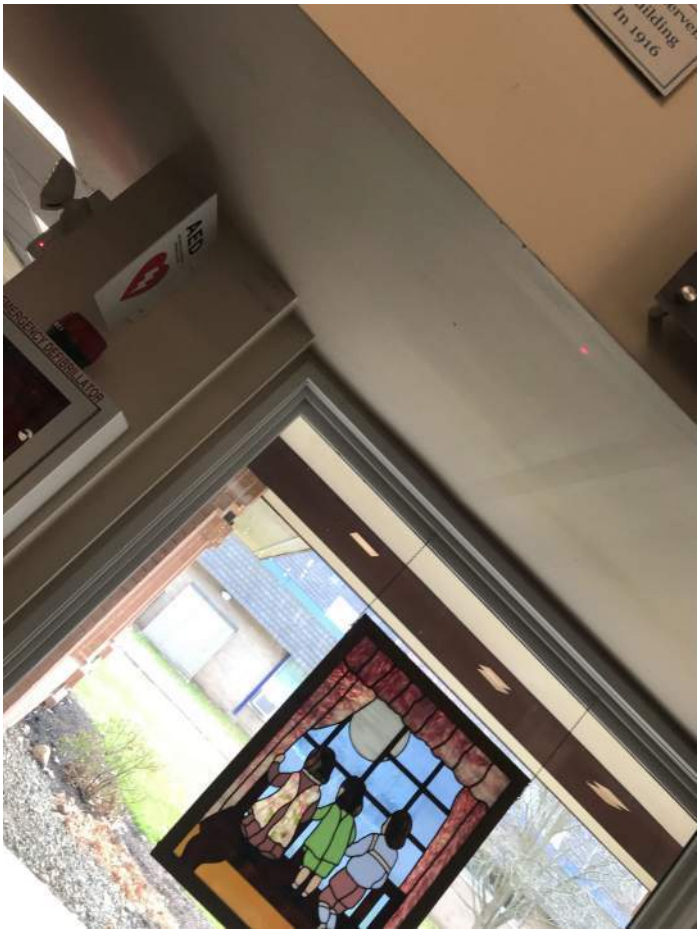

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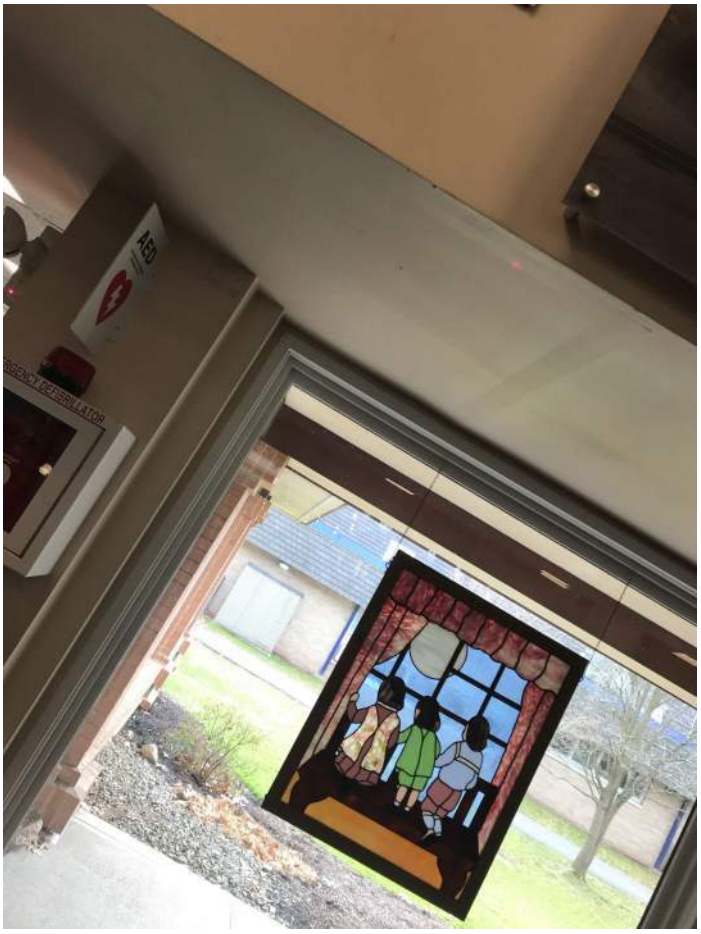

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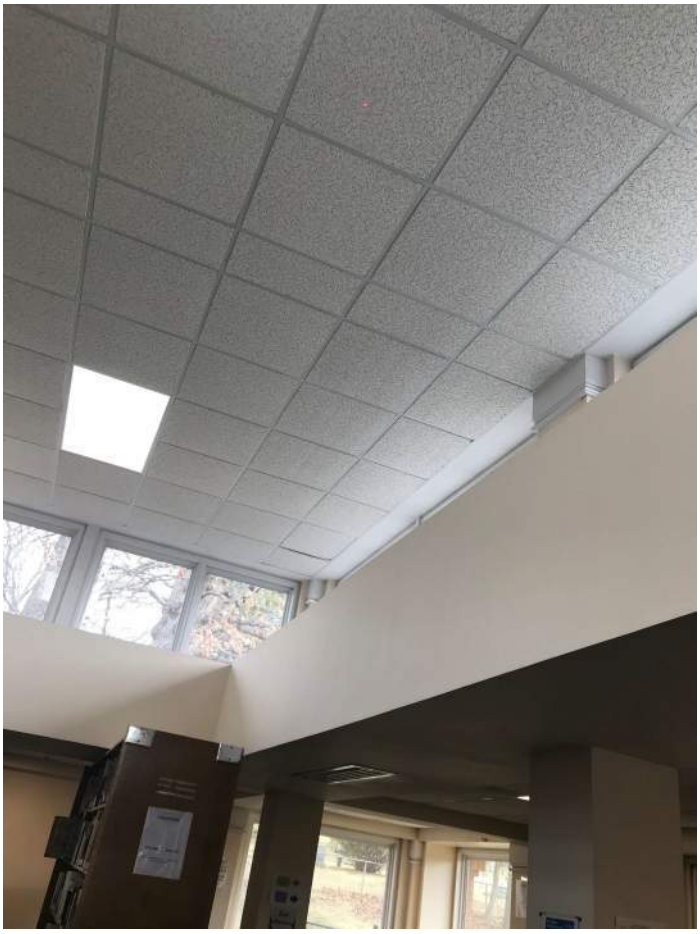

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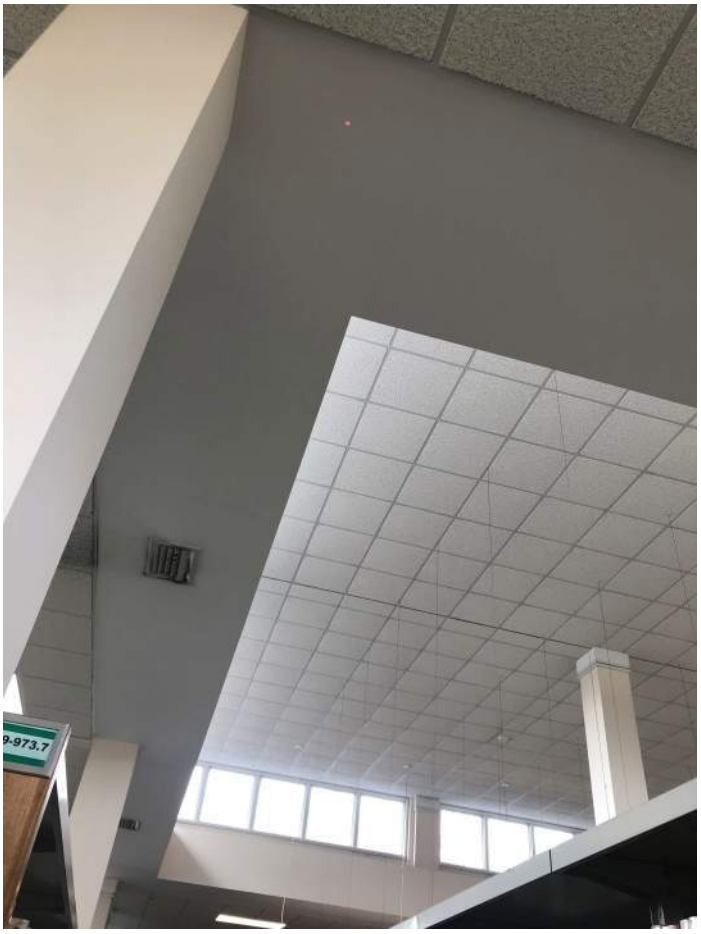

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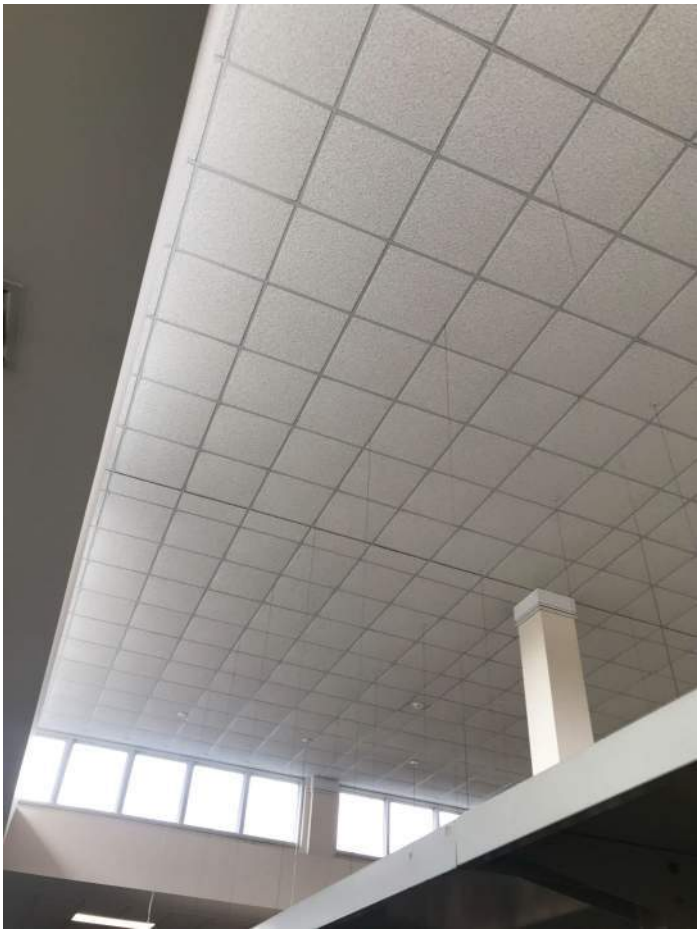

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